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A RAPID SPOT TEST FOR THE IDENTIFICATION OF AMINOPLASTS ON TEXTILES

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A spot test for distinguishing between methylolated urea, ethylene urea, melamine, and certain combination finishes on fabrics is presented. The test method is based on the differences in rates of acid hydrolysis of the various resins. The formaldehyde released during hydrolysis is reacted first with phenyl hydrazine and then with ferric chloride to give a characteristic stain within thirty seconds.

INTRODUCTION

THE art of resin finishing has progressed to the point where, not only can a great variety of effects be produced on numerous fabrics, but these effects can also be produced with numerous resin types. The problem of identification of resin finishes has, therefore, become complex with no simple, rapid identification test available.

An excellent bibliography of the methods currently available for determining the finish of fabrics has been made by Krammes and Maresh (*1*). The finish is usually removed from the fabric by acid hydrolysis (*2*) or solvent extraction (*1, 3*). The resulting liquor is then systematically analyzed for its components by established procedures (*1, 3*). Measurements of physical constants such as Raman, ultraviolet, or infrared spectra (*4*), or refractive indices (*1*) and determination of chemical properties, as reagents specific to various groups (*7*) or interaction with dyes (*5, 6*) are used. These procedures are usually long and complex. They require the service of a trained analyst and special equipment.

Methods based on color reactions have been proposed. The Calcocid Alizarine Blue Stain Test (*6*) can be applied directly to the treated fabric to distinguish between melamine and urea resins.

The test described in this paper is simpler and more rapid than those mentioned above but is also more limited in scope.

Krammes and Maresh pointed out the need for a spot test when they wrote (*1*), "Any satisfactory method for the identification of textile finishing agents is bound to be time consuming, although it would be ideal if a fabric could be spotted with a stain or reagent and the identity of the finish immediately revealed." An approach to this ideal is the purpose of the method proposed here.

GENERAL DISCUSSION

The great majority of resins employed in textile finishing are formaldehyde condensates. Tests showing the presence of formaldehyde, therefore, merely confirm the presence of one of the resin types but do not identify the particular type. Since many textile resins are aminoplasts, determination of nitrogen is not helpful in determining resin types but can be used in predicting the amount of resin finish present once its identity is known.

Resins can be stripped from fabrics by acid hydrolysis liberating formaldehyde. The hydrolysis rates of the aminoplasts vary with the resin type. Melamine-formaldehyde resins show relatively extreme resistance to hydrolysis while ethylene urea—and urea-formaldehyde are more readily hydrolyzed. the latter hydrolyzing most rapidly. From these facts, it would appear that an identification test based on the rate of formaldehyde liberation might distinguish between resin types.

Recently, Jayme and Brausheid (*8*) reported a method for identifying in paper the aminoplasts used to improve wet strength properties. It involved an acid hydrolysis followed by reaction of the liberated formaldehyde with phenyl hydrazine and formation of a colored complex with ferric ions. House and Woodberry (*6*) and Barthel (*9*) improved the test. Preliminary studies soon showed this test, with suitable modification, could be applied to textile fabrics. The range of the test was increased from the methylolated melamine and urea resins used on paper to include methylated methylol melamine and urea and methylol ethylene urea resins as well as certain combinations thereof.

TEST PROCEDURE

The solutions (*10*) employed in this identification test consist of the following:

Solution I———1% phenyl hydrazine—Prepared by dissolving 1 gram phenyl hydrazine in 99 grams of 40% (by weight) aqueous sulfuric acid.

Solution II———10% aqueous ferric chloride (by weight). See note.

The cloth to be tested should be white or contain white areas, although pastel shades may be employed. A drop of Solution I is placed on the fabrics and allowed to stand 30 seconds. An observation of any color change should be noted at this time. Any excess liquid is removed after 30 seconds by blotting. A drop of Solution II is then applied to the area spotted by Solution I. The color change is observed immediately upon applying the second solution and during the next 30 seconds. From the color reactions observed during this time, positive identification of a number of aminoplasts can be made.

Note: Complete test kits containing Solutions I and II can be obtained from Amend Drug and Chemical Co, 117 East 42nd St, New York 10, NY.

TABLE I

TREATED WITH VARIOUS RESINS

Resin employed in cloth treatment	Color reaction with solution I	Color reaction with solution II	Remarks
None	yellow	none	May develop light pink on long standing
Methylol melamine	none	light pink	Slow reaction but faster than untreated
Methylated methylol melamine	none	light pink	Slow reaction but faster than untreated
Methylol urea (monomeric)	gold	blood red	Immediate reaction
Methylol urea (polymeric)	brownish yellow	pale brown	Immediate reaction
Methylated methylol urea	tan	brownish green	Immediate reaction
Methylol ethylene urea	bright yellow	deep red brown	Immediate reaction
Methylated methylol melamine plus methylol urea	faint yellow (slow)	blood red	Slow reaction but faster than untreated
Methylated methylol melamine plus methylated methylol urea	faint yellow (slow)	brownish green	Slow reaction but faster than untreated
Permel resin*	none	light pink	Like methylol melamine except reaction is in drop of liquid which does not penetrate fabric
Permel resin* plus monomeric urea-formaldehyde	gold (in drop)	blood red	Color reactions slow and in drop of liquid which does not penetrate

*Melamine resin base durable water repellent.

RESULTS

The results of the identification tests are shown in Table I.

The fabrics studied in the above tests include 80 x 80 cotton percale and medium weight viscose suiting. The resins employed, all commercially available, were applied to these fabrics by conventional methods. The results reported are on fabrics containing 5% total resin solids. Similar results were obtained at higher resin solids (10%) and at as low as 1% resin solids (lowest concentration studied).

DISCUSSION OF RESULTS

THEORETICAL——In the identification test, formaldehyde (HCHO) reacts with phenyl hydrazine ($C_6H_5NHNH_2$) to form formaldehyde-phenyl hydrazone ($C_6H_5NHN{=}CH_2$) in which the H atom bound to the nitrogen is acidic and can be readily replaced, eg, by a metal (*10*),

$$HCHO + C_6H_5NHNH \longrightarrow C_6H_5NHN{=}CH_2 + H_2O,$$

$$3\,C_6H_5NHN{=}CH_2 + FeCl_3 \longrightarrow Fe(C_6H_5NN{=}CH_2)_3 + 3HCl.$$

A number of metal ions will produce colored complexes with formaldehyde-phenyl hydrazone but the ferric ion is preferred because of its intense color and because it shows a wide range of shades. Chlorine is preferred as the anion because of its solubility.

In performing the test, the simultaneous addition of sulfuric acid and phenyl hydrazine causes a two-fold reaction, 1) liberation of formaldehyde at a rate dependent upon the rate of hydrolysis of the resin tested and 2) formation of yellow formaldehyde-phenyl hydrazone at a rate dependent on the liberation of formaldehyde. Addition of ferric chloride after a lapse of 30 seconds causes the development of shades of red which indicate the amount of formaldehyde-phenyl hydrazone formed.

Resins easily hydrolyzed will show immediate intense colorations because of the presence of large quantities of formaldehyde-phenyl hydrazone. The yellow color of the formaldehyde-phenyl hydrazone in combination with the red color produced by reaction with ferric chloride give rise to the variations in shade which are used to distinguish the different resins. Resins resisting hydrolysis, on the other hand, will show only faint colorations which will require time to develop because only small amounts of formaldehyde-phenyl hydrazone are formed.

Combinations of resin type complicate test performance because of the different hydrolysis rates. Where combinations of resins of both slow and fast hydrolysis rates are employed, initiation of hydrolysis will be delayed, but once started will proceed at a rate approaching that of the readily hydrolyzed resin. In these cases intense colorations will be produced but will require time to develop.

EXPERIMENTAL——The color reactions observed upon application of the test solutions to the various cloths indicated differences not only between untreated and resin-treated cellulosic fabrics but also among the resin types. In the case of untreated cloth, a yellow stain appeared on application of Solution I and no further change was observed upon application of Solution II. The untreated cloth that has been subjected to the action of these spot tests may develop a pink color after several minutes of standing. This color may be due to partial decomposition of cellulose and products evolved therefrom but does not interfere with the performance of the test since it requires more than thirty seconds to develop.

Cloth treated with melamine resins, either methylated or unmethylated, showed little color change upon application of the test solutions, illustrating the resistance of this resin to hydrolysis. The reaction observed, however, was quite distinct from the effect observed on untreated cloth. In the case of cloths treated with melamine resins no change in color was observed on application of Solution I, but a light pink color developed slowly and within thirty seconds after application of Solution II.

The differences in color changes and reaction rates on the cloths treated with the various urea resins were distinct from those of untreated or melamine resin treated cloths. All of the urea resins showed color changes to various shades of yellow when subjected to Solution I. A further change in shade was observed upon application of Solution II. The color reactions were immediate in contrast to the slow reaction of melamine resins, again illustrating the differences in hydrolysis rates of these resin types. The colors after application of Solution I and again after application of Solution II varied sufficiently in shade to permit positive identification of the different urea resin types.

The eighth and ninth examples in Table I represent attempts at identification of mixed resin finishes. In both cases the cloth was treated with a mixture of melamine and urea resins. Surprisingly, positive identification could be made based on reaction rates and color changes. The color reaction observed was typical of the urea resin employed but the reaction rate was typical of melamine resins.

The last two examples represent attempts at identification of water repellent finishes. In the first case the fabric was treated with a Permel Resin, a melamine resin base durable water repellent. The identification solutions did not wet the fabric. However, the characteristic reaction of melamine resins was observed but the

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THE BEHAVIOR OF CERTAIN COTTON AND LINEN FABRICS WITH RESPECT TO THE ABSORPTION OF WATER AND DRYING

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INTRODUCTION

THE absorption of water by and the drying of fabrics have long been recognized as important properties related to the use of textiles for clothing, household, and industrial purposes. To investigate certain aspects of absorption and drying which have not been explored fully, a study has been made of the differences in the absorption of water by and the drying of desized, plain-weave crash dish towelings composed of cotton, flax, and mixtures of 25 percent flax and 75 percent cotton. In this investigation, the following questions were examined: What differences in absorbency of the various towelings occur at different periods in the absorption process? What similarities and differences in absorbency are found on the basis of grams of water absorbed per specimen of constant area as compared with grams of water absorbed per gram of fabric? To what extent might differences in other yarn and fabric properties be responsible for differences in the absorption of water by and the drying of toweling? To what extent are the absorption of water by and the drying of toweling related to the breaking strength of yarns and fabrics? What relationship exists between absorbency and drying properties?

As a result of efforts to develop a rapid, simple, inexpensive, and accurate procedure resembling conditions of actual use, methods developed for measuring the absorption of water by fabrics include the drop-square test, the immersion test, the wick method, a spray method, and wet-surface methods. By means of such procedures, various workers have investigated the way in which fabrics absorb water, the rate of absorption, the quantity of water absorbed, and the relation of rate of absorption to quantity of water absorbed (*1, 2, 3, 4, 5, 6, 7, 8*). Some studies have also been made of the effects of fiber content, yarn and fabric properties, finish, and desizing upon absorption of water by fabrics (*1, 2, 7, 8, 9, 10, 11, 12*).

Relatively few procedures for measuring the drying rates of fabrics under conditions similar to those of drying on a line at home have been found in the literature, more studies apparently having been made under industrial drying conditions. Investigations have been made of the principles of drying (*13*) and of the periods of drying, including the constant-rate period, the falling-rate period, and equilibrium moisture content (*14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24*). The relationships of a few fabric properties such as fiber content, thickness, and weight to rate of drying have also been studied (*8, 9, 11, 18, 19, 22, 25*).

F E Petzel

In a study of the absorption of water by and the drying of white, plain-weave towelings, the weight of water absorbed by desized linen towelings was markedly less than that absorbed to towelings made from cotton or from mixtures of 75 percent cotton and 25 percent flax, the percentage of nonfibrous materials apparently being a factor in this difference. Differences in absorption by towelings composed of cotton as compared with mixtures of cotton and flax were not significant.

Desized linen towelings contained the smallest amount of water after drying for 10 minutes, and the length of the period of constant rate of drying and the total drying time were shorter for linen towelings than for fabric made from cotton or from mixtures of cotton and flax.

There was a close relationship among the grams of water per specimen after drying for 10 minutes, the length of the constant-rate period, and the length of the total drying period. There was also a close relationship between grams of water absorbed per specimen after 8 minutes and the grams of water per specimen after drying for 10 minutes, similar yarn and fabric characteristics having been influential in both cases.

EXPERIMENTAL

Three plain-weave crash towelings of each fiber composition were selected for study. In order that the major variable would be fiber content and that construction factors would differ as little as possible, the yarn size and fabric count (number of yarns per inch) of all three fabrics in each group were as nearly alike as could be found. Before the measurement of yarn and fabric properties, the sizing, finishing, and other nonfibrous materials were removed by treatment in an aqueous solution of starch and protein solubilizing enzyme.

With the exception of the determination of fiber content and sizing, all properties were measured under standard conditions after the toweling had reached moisture equilibrium in an atmosphere having a relative humidity of 65 percent, plus or minus 2 percent, at 70° F, plus or minus 2° F. The yarn number, twist of yarns, breaking strength of yarns by the single-strand method, count, thickness, weight, dry-fabric breaking strength by the raveled-strip method, dimensional change, and total sizing, finishing, and other nonfibrous materials were measured (*26*).

The absorption of water by toweling was studied by means of a wet-surface method involving the use of the Larose device (*7*). Specimens 2 inches by 2 inches were cut, and each was weighed after reaching equilibrium under standard conditions of temperature and humidity. It was then weighed after contact with the wet surface, under a square of glass, for ¼-minute periods up to 3 minutes and for ½-minute periods thereafter up to 8 minutes. For each period, the mean grams of water per specimen and per gram of fabric were calculated. Major statistical comparisons were made for the ¼-, ½-, 1-, 2-, 4-, and 8-minute absorption periods.

For the study of the drying of fabrics, specimens 2 inches square were cut and attached to weighed wire frames by means of loops of fine wire. After the conditioned frame and fabric were weighed, the specimen was soaked in distilled water for 12 hours. The specimen was then weighed at 10-minute intervals, beginning 10 minutes after removal from the water, and weighing was continued until there was no further decrease in weight for five successive weighings. The mean number of grams of water per specimen was calculated for each

interval. The length of time from the beginning of drying until the end of the constant-rate period, the end of the decreasing-rate period in hours, and the grams of water per specimen after drying for 10 minutes were studied.

After the data were collected, they were analyzed statistically by use of the mean, analysis of variance, significant difference between means, standard deviation, degree of precision, and number of specimens required for a certain degree of precision.

DISCUSSION

Absorption of Water

CHARACTERISTICS OF THE ABSORPTION PROCESS——In the absorption curves for the various towelings, the phenomena noted by other investigators were observed. These included time lag in the case of one cotton and two linen towelings, and a period of rapid initial absorption followed by slow absorption as the ultimate absorption point was approached in all but one linen fabric (Figures 1 and 2). The latter was an extremely stiff, heavy linen toweling which probably did not come into as close contact with the wet surface as did the other fabrics. The lack of relationship between initial absorption rate and the absorption at the end of 8 minutes was also in agreement with earlier findings. For example, among the cotton and flax mixtures, fabric 8 had a lower initial rate but a higher absorption after 8 minutes than fabric 7 on the basis of grams of water per specimen. Similarly, among the cotton towelings, fabric 2 had a slower initial absorption rate, but not significantly different absorption after 8 minutes, when compared with fabric 3 on the basis of total grams of water per specimen.

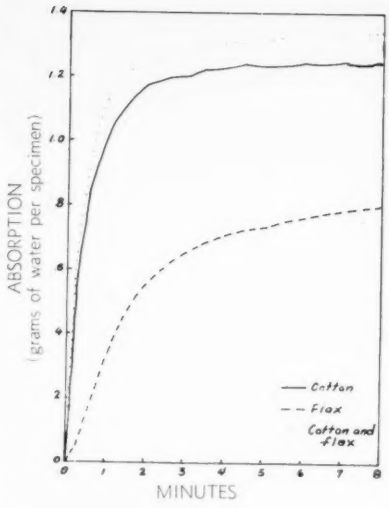

Figure 1

Mean grams of water absorbed per specimen of constant area by desized, plain weave towelings of different fiber content

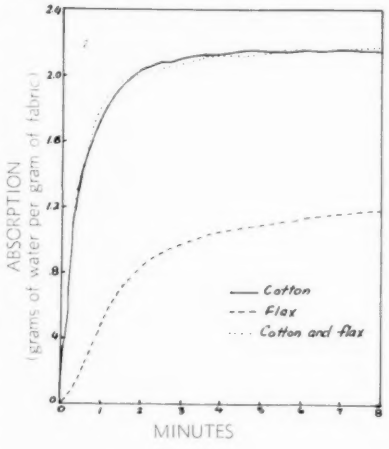

Figure 2

Mean grams of water absorbed per gram of fabric by desized, plain weave towelings of different fiber content

DIFFERENCES IN ABSORPTION OF WATER BY TOWELINGS OF DIFFERENT FIBER CONTENT——Both on the basis of total grams of water per specimen and per gram of fabric, the weight of water absorbed by linen towelings was markedly less than that absorbed by towelings made from cotton or from mixtures of cotton and flax, but differences in absorption by the two latter types of towelings were not significant (Figures 1 and 2).

Because it was not possible to obtain towelings of different fiber content which were exactly alike in construction, the question arose as to the extent to which differences in absorptive properties might have resulted from differences in yarn and fabric properties and in finish rather than fiber content. When the relationships that might be expected on the basis of earlier studies were examined, there was evidence that the greater percentage of nonfibrous materials remaining in the desized linen fabrics may have been one factor in the lower absorbency of linen towelings in comparison with fabrics of the other two fiber compositions (Table I). Greater thickness was associated with the greater absorbency of towelings containing mixtures of cotton and flax as compared with linen towelings. Variations in yarn number, twist, count, and weight did not appear to be important factors in differences in absorbency on the basis of fiber composition.

DIFFERENCES IN ABSORPTION OF WATER BY TOWELINGS OF A GIVEN FIBER COMPOSITION——Among the desized cotton towelings, the grams of water absorbed per specimen were less for fabric 2 than for fabrics 1 and 3 at the ¼-, ½-, and 1-minute intervals, but differences were

TABLE I

YARN NUMBER, TWIST OF YARNS, FABRIC COUNT, THICKNESS, WEIGHT, PERCENTAGE OF SIZING, FINISHING, AND OTHER NONFIBROUS MATERIALS, AND DIMENSIONAL CHANGE OF DESIZED, PLAIN WEAVE TOWELINGS

Fiber composition and fabric	Yarn Number (Grex)[1]		Twists per inch (Number)[2]		Count per inch[3]		Thickness (1/1000 inch)[3]	Weight (Oz per sq yd)[3]	Percentage of sizing, finishing, and other nonfibrous materials[4]	Dimensional change in Percent[5]	
	Warp	Filling	Warp	Filling	Warp	Filling				Warpwise	Fillingwise
Means:											
Cotton	607	769	14.777	11.329	39.8	33.7	20.9	6.74	0.47	−1.70	−0.19
Flax	928	932	6.816	7.558	37.3	30.6	20.6	8.08	1.69	− .87	− .52
Cotton and flax	767	870	12.695	11.013	35.7	30.1	23.9	7.31	1.10	−2.45	− .73
Cotton:											
Fabric 1	564	741	14.740	11.283	38.6	33.1	20.6	6.24	.44	−1.63	.03
Fabric 2	723	670	14.629	11.243	37.9	31.9	20.9	6.59	.63	−1.84	− .53
Fabric 3	534	896	14.962	11.462	42.7	36.2	21.2	7.37	.34	−1.63	− .07
Flax:											
Fabric 4	884	952	7.995	7.810	33.3	28.0	18.4	7.32	1.58	− .90	− .53
Fabric 5	885	877	7.019	8.243	37.7	33.9	20.1	7.80	1.40	− .70	−1.02
Fabric 6	1015	966	5.433	6.621	40.7	29.7	23.2	9.13	2.11	−1.02	0
Cotton and flax:											
Fabric 7	768	762	13.255	11.262	39.5	33.8	22.7	7.65	.99	−2.33	−1.01
Fabric 8	762	969	12.417	10.033	30.9	27.0	25.0	6.88	1.76	−2.88	− .68
Fabric 9	773	878	12.414	11.743	36.7	29.5	24.1	7.40	.54	−2.12	− .50

[1] Means of 9 determinations.
[2] Means of 21 determinations.
[3] Means of 15 determinations.
[4] Means of 6 determinations.
[5] Means of 18 determinations.

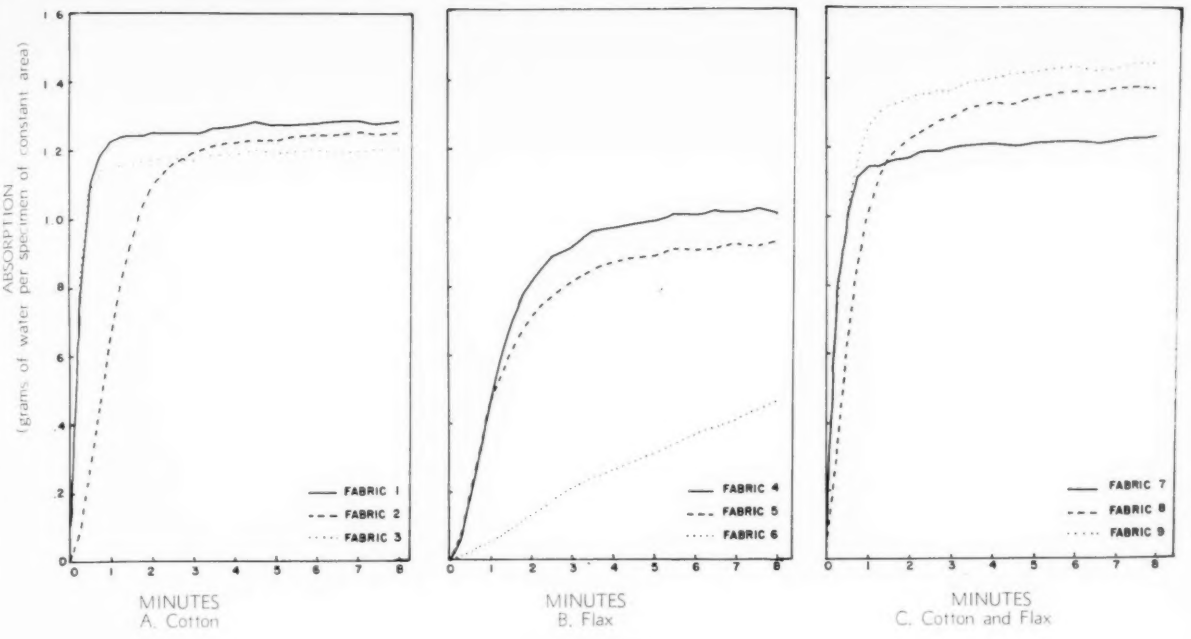

Figure 3

Grams of water absorbed per specimen of constant area by desized, plain weave towelings of different fiber content

not generally significant at 2 minutes or beyond (Figure 3). However, differences between fabrics 1 and 3 in grams of water absorbed per specimen were not usually significant. On the basis of grams of water absorbed per gram of fabric, the following significant differences at the six intervals were noted. Fabric 2 absorbed less water at the ¼-, ½-, and 1-minute intervals than did fabrics 1 or 3 (Figure 4). At intervals of 2, 4, and 8 minutes, fabric 1 absorbed the most water and fabric 3 the least (with one or two exceptions).

Among desized linen towelings, fabric 6, which was an especially stiff fabric, generally had the lowest absorption on the basis of total grams of water per specimen and per gram of fabric. Although fabrics 4 and 5 had similar absorption rates at the first few intervals, they differed quite markedly at the later absorption periods. Fabric 4 absorbed more water per specimen than fabric 5 at 4 minutes and possibly at 8 minutes, and it absorbed more water per gram of fabric than fabric 5 at 4 and 8 minutes and possibly 2 minutes.

Of the towelings containing mixtures of cotton and flax, fabrics 7 and 9 did not absorb significantly different weights of water at the ¼- or ½-minute intervals either on the basis of grams of water per specimen or per gram of fabric, but, from the 1-minute through the 8-minute intervals, fabric 9 held more water than fabric 7.

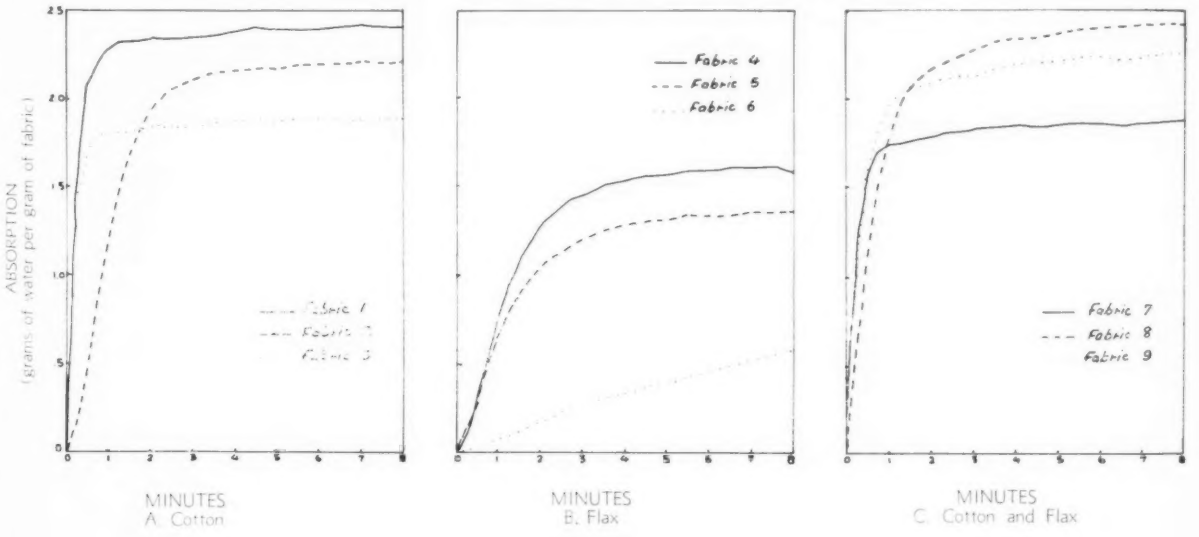

Figure 4

Grams of water absorbed per gram of fabric by desized, plain weave towelings of different fiber content

interval. The length of time from the beginning of drying until the end of the constant-rate period, the end of the decreasing-rate period in hours, and the grams of water per specimen after drying for 10 minutes were studied.

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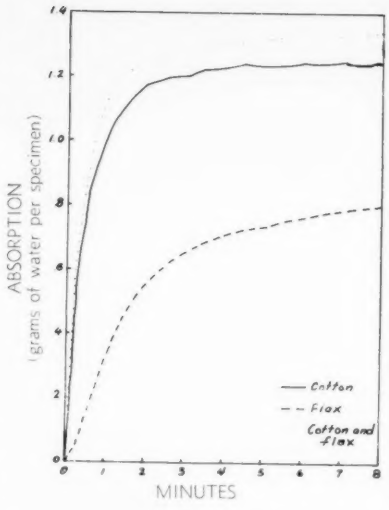

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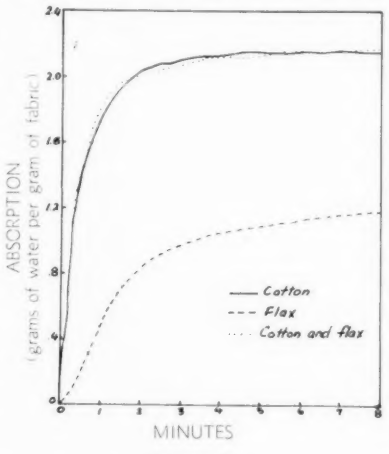

Figure 2

Mean grams of water absorbed per gram of fabric by desized, plain weave towelings of different fiber content

DIFFERENCES IN ABSORPTION OF WATER BY TOWELINGS OF DIFFERENT FIBER CONTENT——Both on the basis of total grams of water per specimen and per gram of fabric, the weight of water absorbed by linen towelings was markedly less than that absorbed by towelings made from cotton or from mixtures of cotton and flax, but differences in absorption by the two latter types of towelings were not significant (Figures 1 and 2).

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[4] Means of 6 determinations.
[5] Means of 18 determinations.

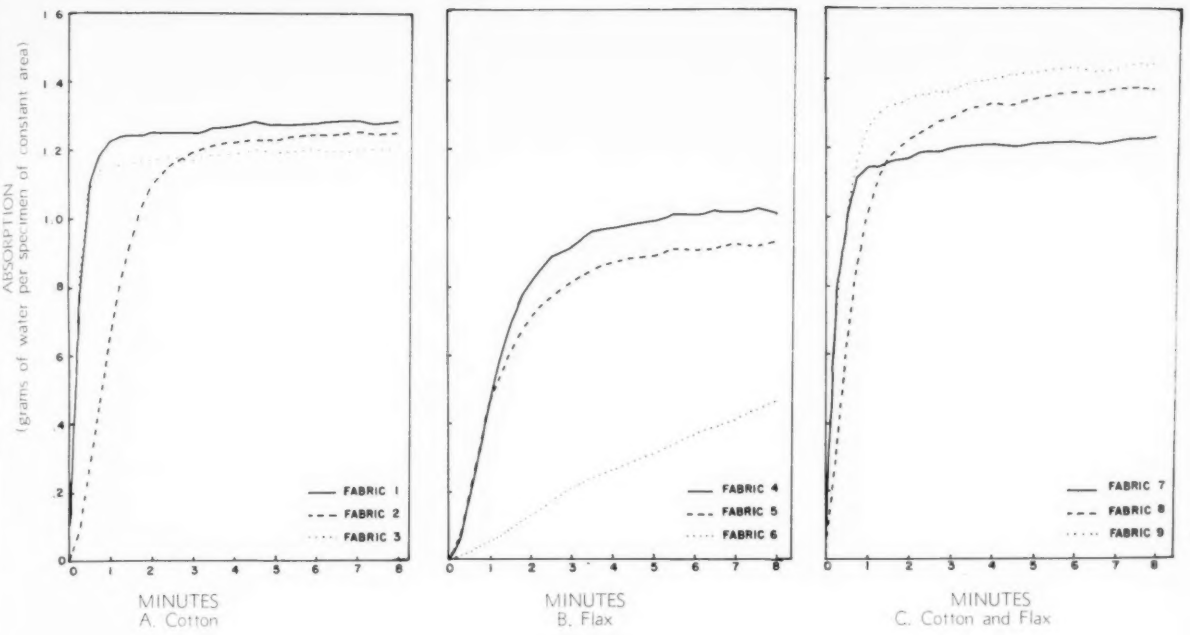

Figure 3

Grams of water absorbed per specimen of constant area by desized, plain weave towelings of different fiber content

not generally significant at 2 minutes or beyond (Figure 3). However, differences between fabrics 1 and 3 in grams of water absorbed per specimen were not usually significant. On the basis of grams of water absorbed per gram of fabric, the following significant differences at the six intervals were noted. Fabric 2 absorbed less water at the ¼-, ½-, and 1-minute intervals than did fabrics 1 or 3 (Figure 4). At intervals of 2, 4, and 8 minutes, fabric 1 absorbed the most water and fabric 3 the least (with one or two exceptions).

Among desized linen towelings, fabric 6, which was an especially stiff fabric, generally had the lowest absorption on the basis of total grams of water per specimen and per gram of fabric. Although fabrics 4 and 5 had similar absorption rates at the first few intervals, they differed quite markedly at the later absorption periods. Fabric 4 absorbed more water per specimen than fabric 5 at 4 minutes and possibly at 8 minutes, and it absorbed more water per gram of fabric than fabric 5 at 4 and 8 minutes and possibly 2 minutes.

Of the towelings containing mixtures of cotton and flax, fabrics 7 and 9 did not absorb significantly different weights of water at the ¼- or ½-minute intervals either on the basis of grams of water per specimen or per gram of fabric, but, from the 1-minute through the 8-minute intervals, fabric 9 held more water than fabric 7.

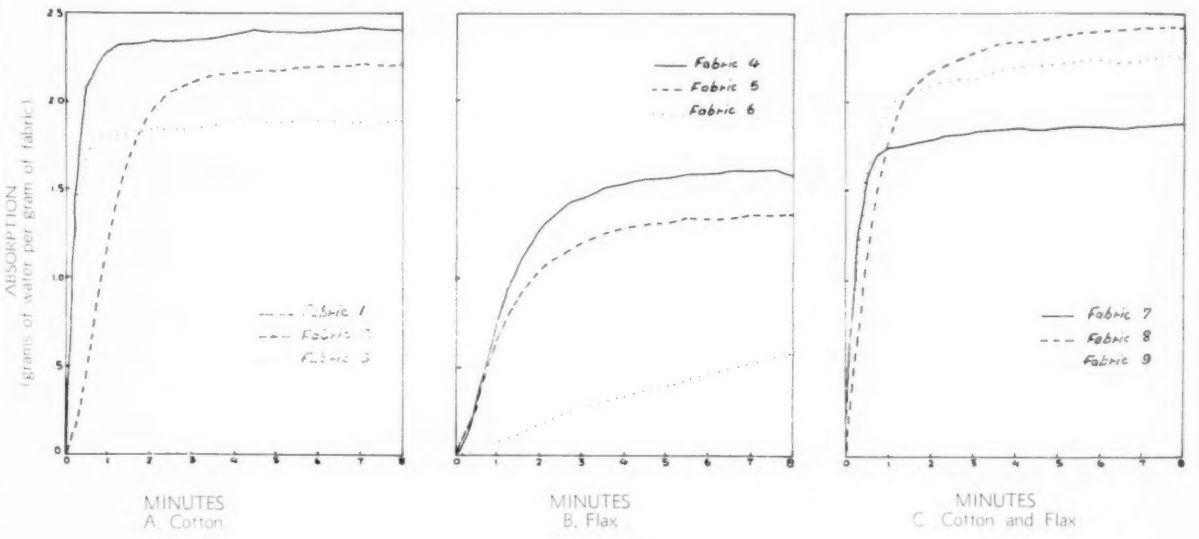

Figure 4

Grams of water absorbed per gram of fabric by desized, plain weave towelings of different fiber content

On the basis of grams of water per specimen, fabric 8 absorbed less water than the other two fabrics from the ¼- through the 1-minute intervals, but, from the 2-minute through the 8-minute intervals, it was intermediate between the other two fabrics. On the basis of grams of water per gram of fabric, fabric 8 took up less water than the other two fabrics at ¼ and ½ minute. From 2 to 8 minutes, it took up more water than fabric 7, and, at 4 and 8 minutes, it may possibly have taken up more water than fabric 9.

When the possible factors in differences in absorbency were examined, in certain cases, there was evidence that a relatively high count and a comparatively high percentage of nonfibrous materials were associated with low absorbency among towelings of each fiber composition. In some cases high weight of cotton toweling was coupled with high absorbency, and high yarn number, low twist of yarns, and high thickness were possible factors in the relatively high absorbency of toweling containing mixtures of cotton and flax.

RELATIONSHIPS OF ABSORPTION OF WATER TO BREAKING STRENGTH OF YARNS AND FABRICS——Because both durability and high absorption of water may be desired, the purchaser of toweling may wonder whether or not good absorptive properties and high breaking strength may be found in the same fabric. When fabrics of different fiber contents were compared as groups, the linen towelings were the strongest warpwise but the least absorptive of the three fiber composition groups, but the towelings made from cotton or mixtures of cotton and flax did not differ significantly either in breaking strength or in absorbency (Table II). When comparisons were made among towelings of a given fiber content, relatively high breaking strength and high initial absorption rate were found in combination in towelings made from cotton or from mixtures of cotton and flax. However, it would be necessary to sacrifice either breaking strength or absorbency in choosing a desized linen toweling as there appeared to be an inverse relationship between the two properties at the longer absorption intervals.

Drying of Towelings

The drying curves for desized towelings made from cotton, flax, and mixtures of cotton and flax showed the usual constant-rate period followed by a decreasing-rate period until the equilibrium moisture content was approached (Figures 5 and 6). As found by Fourt and others (22), the rates of drying during the constant-rate period were approximately the same for all fabrics regardless of fiber content.

When the drying of towelings of different fiber content was compared, desized linen towelings contained the smallest amount of water after drying for 10 minutes, and the length of the period of constant rate of drying and the total drying time were shortest for linen toweling (Table III). Because of the relatively large amount of water held by fabric 8 after 10 minutes of drying, on the average the toweling containing mixtures of cotton and flax probably contained slightly more water after drying for 10 minutes and probably had a slightly longer total drying period than cotton toweling. When the drying of towelings of the same fiber content was compared, differences in grams of water held after drying for 10 minutes, the length of the constant-rate period, and the length of the total drying period were not significant among cotton fabrics. Linen fabric 4 contained more water after drying for 10 minutes, had a longer constant-rate drying period, and had a longer total drying period than did fabrics 5 or 6. Among towelings containing mixtures of cotton and flax, fabric 8 contained a greater weight of water after drying for 10 minutes and had a longer constant-rate period and a longer total drying period than did fabric 7.

It may be concluded that there was a relatively close direct relationship between the total grams of water per specimen after drying for 10 minutes, the length of the period of constant rate of drying, and the length of the total drying period.

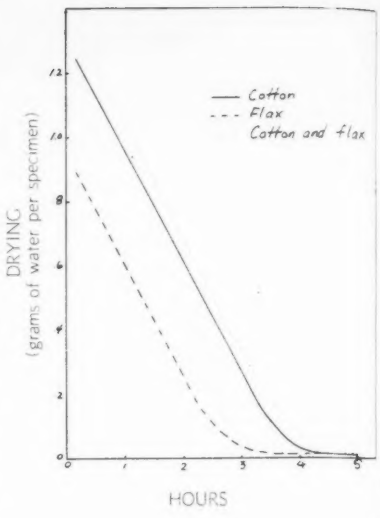

Figure 5
Mean grams of water per specimen of 4 square inches during drying of desized, plain weave towelings of different fiber content

In general, there was a close relationship between the grams of water absorbed per specimen after 8 minutes and the grams of water per specimen held after drying for 10 minutes. In both cases, linen fabrics contained less water than towelings made from cotton or from mixtures of cotton and flax.

Differences in weight of water per specimen among different cotton fabrics after absorption for 8 minutes and after drying for 10 minutes were not significant. Among linen towelings, fabric 4 contained more water than fabric 5 on the basis of grams of water per specimen both after absorption for 8 minutes and after drying for 10 minutes. Because fabric 6 absorbed

TABLE II

YARN AND FABRIC BREAKING STRENGTH FOR DESIZED, PLAIN WEAVE TOWELINGS

Fiber composition and fabric	Breaking strength of yarns (Grams)[1]		Breaking strength of fabric, raveled-strip method (Pounds)[2]	
	Warp	Filling	Warp	Filling
Means:				
Cotton	767.7	881.3	63.22	63.64
Flax	1050.3	961.6	106.83	78.77
Cotton and flax	731.9	796.3	57.52	56.77
Cotton:				
Fabric 1	751.6	801.6	63.28	55.43
Fabric 2	799.1	749.3	59.37	53.93
Fabric 3	752.4	1092.9	67.02	81.57
Flax:				
Fabric 4	654.4	750.9	60.33	58.07
Fabric 5	954.2	765.8	99.52	60.78
Fabric 6	1542.2	1368.0	160.65	117.45
Cotton and flax:				
Fabric 7	660.9	596.4	60.88	56.67
Fabric 8	678.7	844.9	46.23	52.00
Fabric 9	856.0	947.6	65.43	61.98

[1] Means of 45 determinations.
[2] Means of 30 determinations.

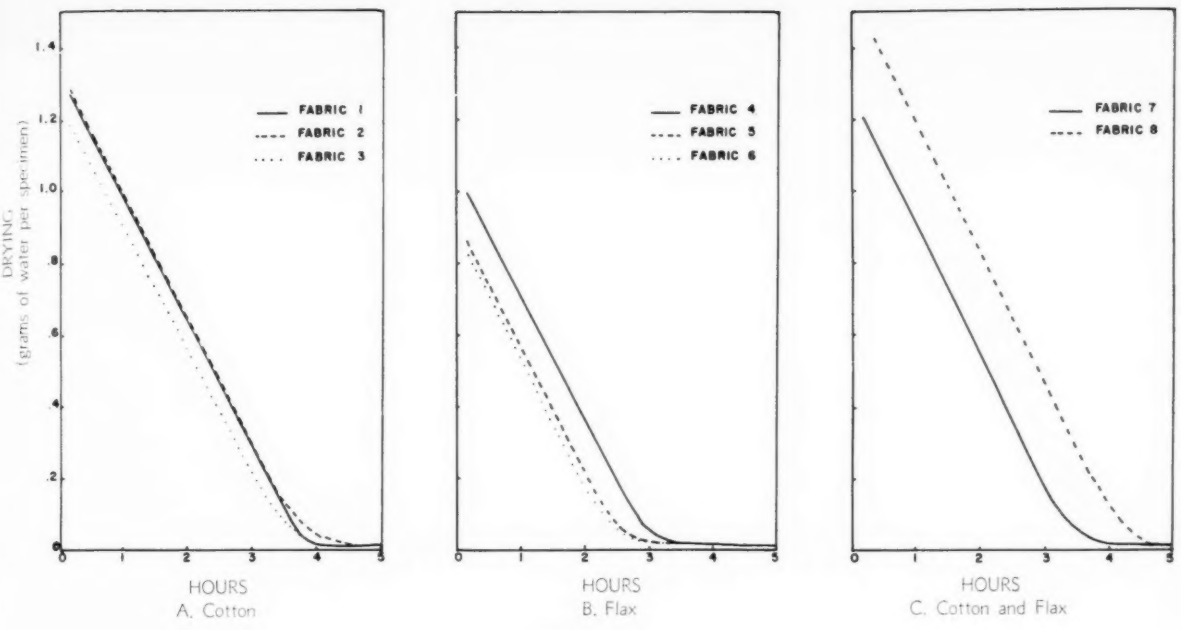

Figure 6

Grams of water per specimen of 4 square inches during drying of desized, plain weave towelings of different fiber content

water much more slowly than other linen fabrics, it contained the lowest weight of water after absorption for 8 minutes. However, it did not contain a significantly different amount of water from fabric 5 after drying for 10 minutes. Among towelings containing mixtures of cotton and flax, fabric 8 contained a greater weight of water than fabric 7 on the basis of grams of water per specimen both after absorption for 8 minutes and after drying for 10 minutes. Consequently, it may be concluded that, except in the case of fabric 6, similar fabric characteristics probably influenced the number of grams of water absorbed per specimen after 8 minutes and the weight of water present after drying for 10 minutes.

SUMMARY

In this study, a comparison has been made of the absorption of water by and drying of desized, white, plain weave towelings made from cotton, flax, and mixtures of 75 percent cotton and 25 percent flax.

The weight of water absorbed by desized linen towelings was markedly less than that absorbed by towelings made from cotton or from mixtures of cotton and flax, the percentage of nonfibrous materials apparently being a factor in this difference. However, differences in absorption by towelings composed of cotton as compared with mixtures of cotton and flax were not significant. The drying rates for the constant-rate period were nearly the same for all fabrics regardless of fiber content. Desized linen towelings contained the smallest amount of water after drying for 10 minutes, and the length of the period of constant rate of drying and the total drying time were shorter for linen towelings than for fabric made from cotton or from mixtures of cotton and flax.

There was a close relationship among the grams of water per specimen after drying for 10 minutes, the length of the constant-rate period, and the length of the total drying period. There was also a close relationship between grams of water absorbed per specimen after 8 minutes and the grams of water per specimen after drying for 10 minutes. Except for one linen toweling, similar characteristics probably influenced the number of grams of water absorbed per specimen after 8 minutes and the weight of water present after drying for 10 minutes.

When relationships between absorbency and breaking strength were considered, it was seen that, although linen towelings were the strongest warpwise, they were the least absorptive of the three fiber compositions, and they dried in the shortest period of time. Towelings made of cotton did not differ significantly from those made from cotton and flax either in absorbency or in breaking strength.

TABLE III

GRAMS OF WATER PER SPECIMEN AFTER DRYING 10 MINUTES, END OF PERIOD OF CONSTANT RATE OF DRYING, AND END OF PERIOD OF DECREASING RATE OF DRYING OF DESIZED, PLAIN WEAVE TOWELINGS[1]

Fiber composition and fabric	Grams of water per specimen after drying 10 minutes	End of constant rate period (Hours)	End of decreasing rate period (Hours)
Means:			
Cotton	1.248	3.39	4.22
Flax	.896	2.19	3.36
Cotton and flax	1.349	3.42	4.53
Cotton:			
Fabric 1	1.272	3.47	4.17
Fabric 2	1.284	3.44	4.33
Fabric 3	1.186	3.25	4.17
Flax:			
Fabric 4	.996	2.53	3.75
Fabric 5	.859	2.08	3.22
Fabric 6	.833	1.97	3.11
Cotton and flax:			
Fabric 7	1.209	2.97	4.14
Fabric 8	1.489	3.86	4.92

[1] Means for 6 specimens.

ACKNOWLEDGMENT

The writer wishes to express her appreciation to Professor Ethel L Phelps for her help in directing this study and to Dr Horace L Thomas for his advice on statistical methods. The work was made possible partly through the financial assistance of the Effie I Raitt Fellowship of the American Home Economics Association.

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• PATENT DIGEST •

PAUL WENGRAF

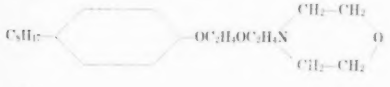
GAS-FADING PREVENTION———Alkylaromatic Ethers Linked to Tertiary Amines (C, 1)

USPat 2,706,142 (General Aniline & Film—Von Glahn, Stanley—April 12, 1955)

Gas fading has been observed mostly in dyeings with the blue anthraquinoneamine dyes, but many other azo and vat dyes are known to fade as well. Although a great number of protective agents have been advocated in the past for use either in a pretreatment or aftertreatment, the desirability of an agent or a class of agents that can be applied directly in the dyebath is obvious. An ideal gas-fading preventive should have also the following properties: it must be easily dispersible, colorless, withstanding in itself light and gas fumes without any discoloration, should be fast to washing and/or drycleaning, odorless, nontoxic, and, above all, substantive to the cellulose derivative (acetate) like the dyestuff itself.

According to the current patent a class of compounds fulfilling the above requirements has been found. A general formula for these compounds is given as

wherein R is an alkyl from 4-12 C; Ar is an aromatic group such as benzene, naphthalene and so on; A is ethylene or propylene, and R_1 and R_2 are alkyls, aryls, etc, or atoms able to form cyclic N-compounds such as pyridine, morpholine as in



etc.

Substances of this class can be prepared, according to USPat 2,170,111 (Rohm & Haas-Bruson/1939), from alkyl-aryloxy-alkoxy alkylene chlorides and a secondary amine.

Example: p (tetramethyl butyl) phenoxy ethoxy ethyl dimethylamine, ie,

(also especially protected by the claim), was dispersed in a mixture of emulsifiers of the Igepal and Emulphor type and diluted with water. 2-4% of this emulsion (calculated from the material's weight) was added to a dyebath containing approximately 0.2% of an amino anthraquinone dye. After a dyeing period of about 10 minutes at 71-88°C, a bright blue coloration resulted. This specimen and a control sample, where the gas-fading inhibitor had been omitted, were subjected to the AATCC Gas-Fading Test (1946 Year Book p 285-289). The nonprotected sample faded badly after 8 hours, while the protected sample showed a fading resistance of 2+. The product itself did not turn yellow when applied on white material upon exposure to gas fumes.

Among the references cited by the Patent Office:

USPat 2,539,212 (Gen Aniline/1951): preventing gas fading of dyeings on cellulose ester fibers by applying dispersions of N-N'-dibenzyl dialkyl ethylene diamine.

USPat 2,083,122 (Celanese Corp of Am/1937): preventing gas fading by incorporating into the acetate spinning mass alkylamines, pyridine, dimethylaniline or other amino-type compounds.

USPat 2,008,902 and 2,017,119 (Celanese Corp of Am/1935): improving fastness of cellulose acetate dyeings and preventing gas-fading by incorporating colorless aralkylamines but no arylamines.

An article by Salvin et al in *Am Dyestuff Reptr* 41, 207-304 (1952) contains theoretical and practical studies on gas fading in general. Causes of gas fading have been established and the best inhibitors for reacting with NO_2 or counteracting its effects have been tabulated.

The use of various additives in resin treatments may have an effect on the color reaction of the identification test. The use of resins other than those investigated, alone or in combination with those investigated, might also complicate the color reaction. These and other similar considerations require additional evaluations.

Cloth which has been tested by this identification stain will disintegrate if allowed to stand for several hours. However, if after the identification is complete the stained fabric is immediately rinsed in water and neutralized with dilute sodium bicarbonate solution, the fabric will not be damaged. A slight stain usually persists on the fabric. The intensity of the stain will be proportional to the degree of coloration formed during the identification test.

While this test is not the ideal "one solution instantaneous color spot test," it approaches this goal. It is a positive identification test for melamine and a number of urea resins and certain combinations thereof.

Proceedings of the

American Association of Textile Chemists and Colorists

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Future Papers

Manuscripts of the following papers, all of which have been presented before local sections of AATCC, have been submitted to date to the publishers of American Dyestuff Reporter. Subject to the approval of the AATCC Publications Committee, all will appear in the Proceedings in future issues.

Authors and Section Officials are requested to inspect this list, and notify the publishers if there are any omissions.

"Practical Interpretations of the Results of Laboratory Investigations in the Field of Vat Printing"—Maurice R Fox, Arnold, Hoffman & Co, Inc and Imperial Chemical Industries Ltd

"Chemical Considerations of Woolen and Worsted Finishing"—Herbert C Haller, S Stroock & Co, Inc

"Some Aspects of the Newly Developed Crypto-Anionic Surface-Active Agent"—H G Seifert, Sandoz Chemical Works, Inc

"Hibulk Acrilan"—S Jack Davis, The Chemstrand Corp

"Arnel Triacetate—Its Properties, Applications and Dyeing Characteristics"—A F Tesi, Celanese Corp of America

"The Dyeing and Related Processing of Nylenka"—Ross M Stribling, American Enka Corp

"Cotton Finishing"—Hector C Borghetty, Rohm & Haas Co

"Arnel—1956"—Fred Fortress, Celanese Corp of America

"A Study of Wash and Wear Cottons"—Charles R Williams, Monsanto Chemical Co

"Aesthetic Standards in Textile Print Designs"—D D and Leslie Tillett, House of T Fabrics

"Wash and Wear Finishes on Cotton Fabrics"—Hector C Borghetty, Rohm & Haas Co

"Wash and Wear Fabrics"—E W Lawrence and R H Phillips, Cranston Print Works Co

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June 1, 1956

SENIOR

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Ralph A Supper—Technical Div liaison engineer, Quaker Chemical Products Corp, Conshohocken, Pa.

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

Frank J Feeny
Francis A Flynn
Raynard R Metzinger
Robert A McGurren
Edward Rychalski

COLORIMETRIC EVALUATION OF COLOR GRADIENTS in the Woolen and Worsted Industries*

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In this article a method of quantitatively evaluating color gradients or "shadiness" in wool and wool-like textiles is outlined. The procedure is based on spectrophotometric colorimetry coupled with statistical analysis. The color difference formula widely known as the Adams-Nickerson equation is used as a basis for determining the magnitude of the color differences involved. A tolerance has been found to exist statistically between "shady" and "nonshady" pieces at a CD of 0.5-0.4 units based on a multiplicative constant of 40 in the color difference equation. Practical application has shown this method to be useful in numerous ways.

INTRODUCTION

FOR such varied reasons as color migration in drying, uneven carbonizing, and differential dyeing, color gradients may occur in a textile material. In general this problem may be divided into two parts:

1) Where the gradient is relatively uniform throughout a large section of the piece, such as from one side to the other.
2) Where the gradient is confined to a small area and is typified by its lack of uniformity.

For the purposes of the discussion we shall consider the former to represent true "shadiness," the latter "color streaked" or "cloudy."

It is perhaps worthwhile to discuss briefly "shady goods" in a general way for the benefit of those readers who may not have been intimately concerned with the problem.

It might be said that "shadiness" probably causes more difficulty in the woolen and worsted industry (and others) year in and year out than any other single cause. Many dyers have been dismissed as a result of an excessive number of "shady" pieces. Economically, the problem is of considerable importance, an onset of "shadiness" often being sufficient to cause the mill severe losses. Plants have literally been torn apart in an effort to track down the latest cause of too many shady pieces.

In many cases the exact cause of the problem may never be discovered. Instead the final result is usually the cumulative effect of several operations which have slowly worked themselves out of control. The "cure" often involves correcting small details in many areas, although particularly notorious are the drying and carbonizing operations. In cases where a severe problem exists, a study of the situation by the plant chemist frequently reveals the trouble spot.

This paper is not to be considered as a panacea for "shady goods" problems. However, it would seem worthwhile to point out the fact that in many respects the problem is statistical in nature. The final allowable tolerance is quite well defined, as will be pointed out later. If we assume that satisfactory fabrics are being produced, then it is useful to consider the process "in control." In other words, the variation in each step may be considered of such a nature that the cumulative effect does not result in the production of more than approximately 5% faulty pieces. Of course this 5% does not represent all "seconds" as the dyer and finisher still have recourse to various "tricks of the trade" to correct these faults. In the case of excessive "shadiness" one may consider it as arising from loss of control in one or more operations. It should also be pointed out that these operations are not independent, ie, uneven carbonizing is reflected in the dyeing operation which follows. However, it is important to realize that although the individual variation within a given process may not seem sufficient to cause shadiness, it may couple with other "in control" variations in such a manner as to produce a color variation in the final pieces which will *more* than 5% of the time appear faulty. Although the causes and economics of shadiness could be treated at great length, such a discussion is not justified in this article. Instead we will concern ourselves with a method of evaluating shadiness. That is, we shall attempt to answer the question, "Is there sufficient color difference between areas to call this piece shady?" The answer will involve the application of precision colorimetry and statistical methods.

EVALUATION OF SHADINESS

In order to have a basis for discussion let us consider the following hypothetical case:

Several pieces are returned to the manufacturer by a customer as being unacceptable because of "shadiness". The pieces are taken to the "Perch" or inspection station where they may be studied by the various supervisors concerned. A piece is examined by placing various areas adjacent to one another in loose folds. These may be interchanged or viewed in any manner the inspector feels desirable. It should be pointed out that under these conditions of viewing the background color is always very nearly identical to that of the areas being examined. This, plus the large area involved, results in a nearly ideal situation for attaining maximum sensitivity to small color differences (*1*). That this is true may be readily demonstrated by cutting out a small section incorporating the color difference, in many cases the difference would be at best scarcely detectable. Let us assume that there is a question at this point as to whether the piece is really faulty. In other words one side says it is, the other it isn't. A referee is needed. In this situation Spectrophotometric colorimetry has proved useful.

In the author's laboratory a considerable number of pieces (several hundred) representing acceptable and non-acceptable production have been measured using a General Electric Spectrophotometer and Librascope-(GE) Integrator (*2*). It was noted quite early in the investigation that, with the exception of blues, only very infrequently (less than 5 in 100) was a piece considered shady if it had a color difference (CD) of less than 0.5 using the Adams-Nickerson formula for color difference (*3*). In the case of blues a difference of 0.4 was found to represent the lower tolerance point. As the size of the color difference increased over these values, various degrees of shadiness were

*This paper was presented initially before the Northern New England Section on October 8, 1954. The discussion and some of the data contained herein are based in part on a Master of Science thesis submitted to Lowell Technological Institute by the author in 1953.

noted. The intermediate graduations probably are not defined as precisely as the upper and lower limits. It can be stated with considerable confidence, however, that any color difference greater than 1.0 will be called badly shady. Let us next consider in more detail the method employed in the color measurement laboratory when a piece arrives to be evaluated for excessive color gradation.

As it may be somewhat impractical to transport the entire piece to the laboratory, a piece is torn from either end, which represents the color defect. If the shadiness is of such a nature as to make this impossible without destroying the economic value of the material, then the areas between which differences appear, are marked at the "Perch" and these are then measured using the whole piece. This is not usually necessary. The laboratory procedure is then as follows:

1) The strip obtained from the plant is divided into a left side, right side and center section (See Figure 1). If this can be done at the inspection station where the shadiness is observed, so much the better.
2) Sufficient measurements are made so that representative results are obtained for each area. This usually involves 3 or 4 measurements in each area. Of course, this depends on the variation within a given area.
3) The measurements in each area are averaged and color differences calculated between the various areas, namely, right to left, right to center, and left to center, using the Adams-Nickerson Equation.
4) If any difference greater than 0.5 CD units (using 40 as the constant in the color difference equation) exists between any two areas listed in (3), the piece *may* be called shady. Of course, under the pressure of a "sellers" market, differences greater than this may be (and are!) accepted.
5) Before evaluating the color differences as discussed in (4) attention is given to the variation within an area as compared to the variation between areas. Simple statistical tests involving the range and confidence intervals of the range (4) are usually sufficient.

If it is found that there is more variation within an area than between areas and if this difference is greater than 0.5, the piece is not called "shady" but rather "color streaked" or "cloudy".

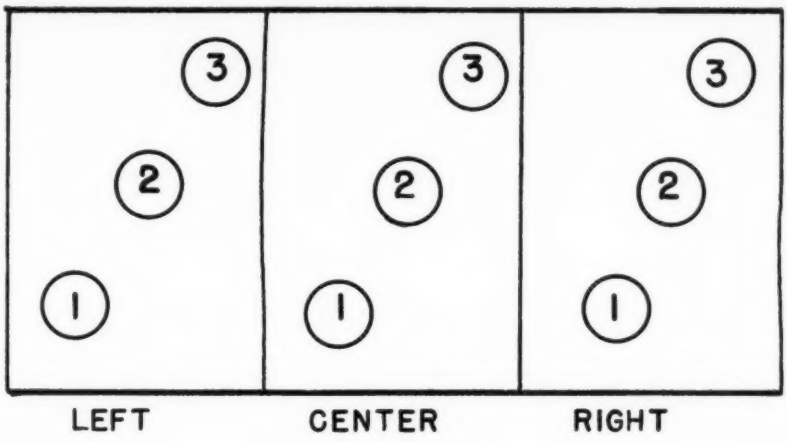

Figure 1
Cloth strip pattern for measurement

DISCUSSION

The procedure outlined above has been used for over four years in the author's laboratory. The experience gained in this period can be embodied in a brief discussion.

We have found that any piece having less than the specified color difference (0.5-0.4) is not called shady statistically, that is, more than 5 times out of a hundred (See Figure 2). The reason for the different tolerance between the blue and other regions is probably due to deviation from uniformity of the particular color space embodied in the Adams-Nickerson equation. In practice no serious problem is encountered because of this.

It should also be mentioned that other work in this laboratory has not shown the Adams-Nickerson calculated color differences to be as reliable when the color differences are larger and the background color is not similar to the sample being viewed. Its usefulness in the case of the very small difference involved here is due, at least in part, to the fact that most current color difference formulas give good correlation with visual results when the differences are slight.

The procedure may seem quite lengthy but it can usually be carried out in about an hour or two in a laboratory where adequate color measuring equipment is available. It is not suggested that this be used in a routine manner, but rather as a "referee" in cases where conflicting visual estimates arise. It should further be mentioned that this method has never been used directly to coerce either party in a dispute over "shadiness". It would be entirely feasible, from the colorimetric viewpoint, to write a contract based on this procedure, but this has not been done, and the probability of its being used in this manner in the near future is remote.

One of the most useful aspects of this procedure is in overcoming a psychological problem which frequently arises. It is well known that the eye performs excellently day in and day out in detecting and evaluating small differences of the nature involved in shady pieces. However, it has been noted that the visual "yardstick" is subject to change depending on the past history of "shadiness" in the particular mill.

Of particular value over a period of time has been the ability to ascertain, from past records, that a flurry of rejects due to shade gradation may be occurring in cases where the actual "shadiness", as determined

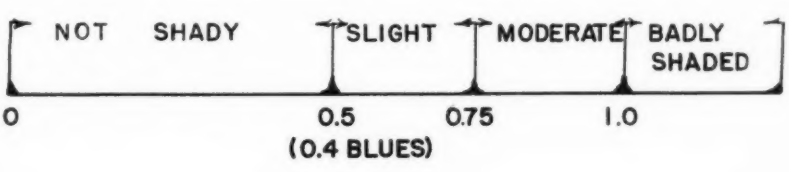

Figure 2
Color differences for varying degrees of shadiness

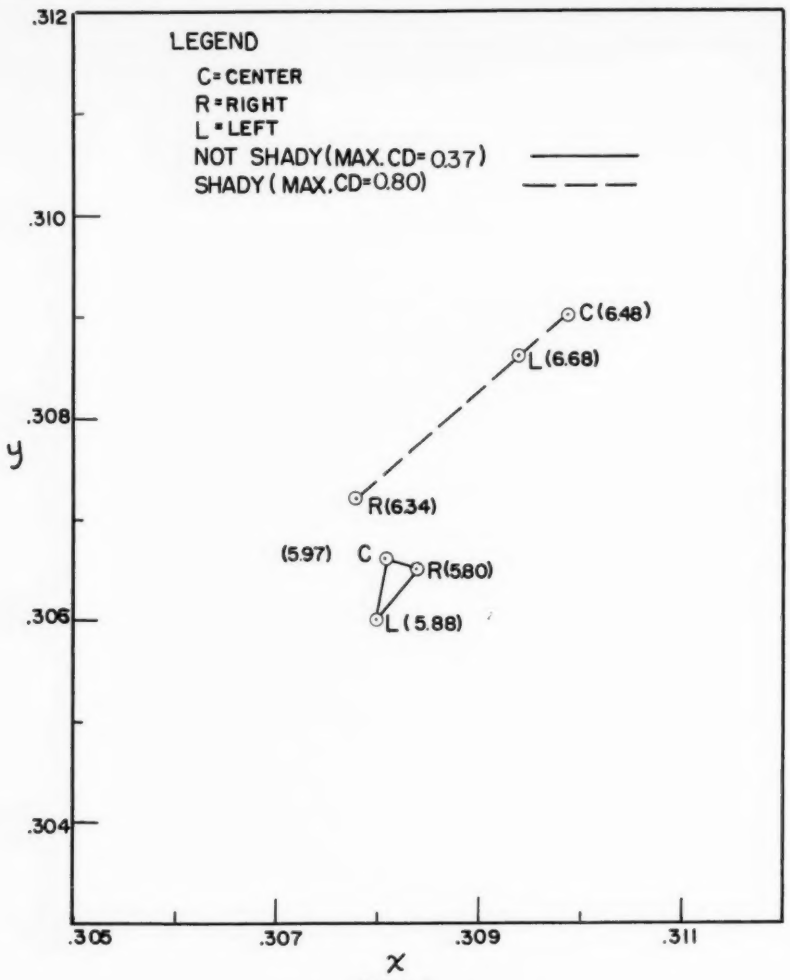

Figure 3
Example of a shaded and nonshaded piece

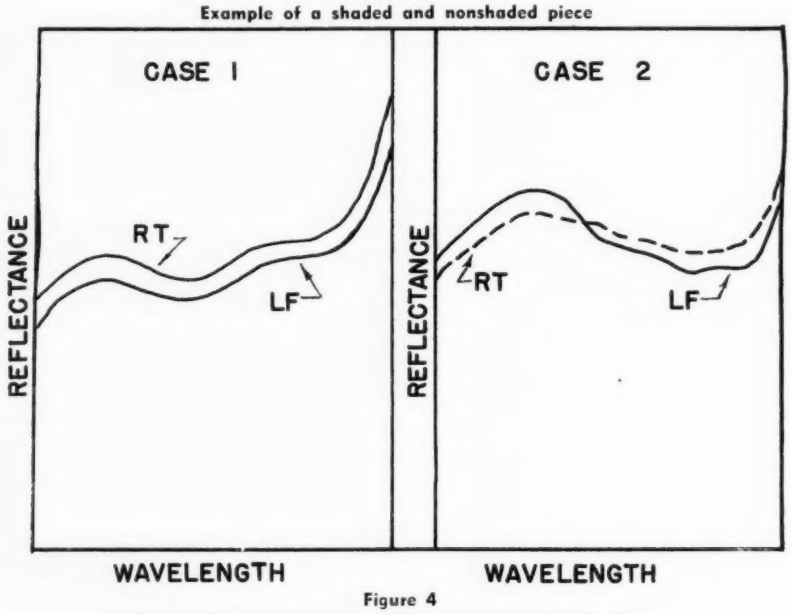

Figure 4
Spectrophotometrical curves illustrating cause of shadiness

by the method outlined above, is not statistically different from the mean based on years of successful production on that shade. Such an observation is useful in restoring the inspector's visual "yardstick" to normal or average from the supercritical one which may have developed.

In many cases a study of the problem in this manner brings to light certain regularities and trends in the faultiness which may aid those attempting to solve the problem. Such details are best shown by plotting the average color coordinates of each area on a section of the chromaticity diagram. A plot for "shady" and a "non-shady" piece are shown in Figure 3. By superimposing several pieces of different lots regularities are made apparent. It makes little difference that the samples may be of a different hue. Further, once a piece has been assessed as "shady" a study of the spectrophotometric curve of the two areas is frequently informative in revealing which dyestuff in the combination (if any) is the trouble-maker. From the known properties of the dyes, such information may often present a valuable clue to the source of trouble (see Figure 4).

Further, in several cases it has been possible to evaluate fine checks and plaids by taking sufficient measurements so that a statistical evaluation was possible. Of course, this usually involves a greater number of measurements than the usual case.

The details of solving the Adams-Nickerson equation for a given case have been previously discussed in this journal (*3, 5*). However, for continuity, an actual case is worked out in Table I. The most expedient way to solve this equation is by means of a nomograph. Such a nomograph has been constructed and employed in our laboratory. It is felt that this is not only faster than looking up results in a table, but reduces the chance of error in calculation.

A further application of the principles discussed in this paper is shown in Figure 5. Suppose that one is interested in studying the occurrence of shadiness as a function of process. An interesting approach is as follows:

1—At each stage in the process (see y axis, Figure 5) a narrow strip (2″) is torn from the fabric.
2—This strip is then measured as outlined above for shady goods evaluation.
3—The results are then plotted in the manner illustrated. The dotted line represents the tolerance for shadiness.

From such a plot (and particularly a correlation between plots) one ob-

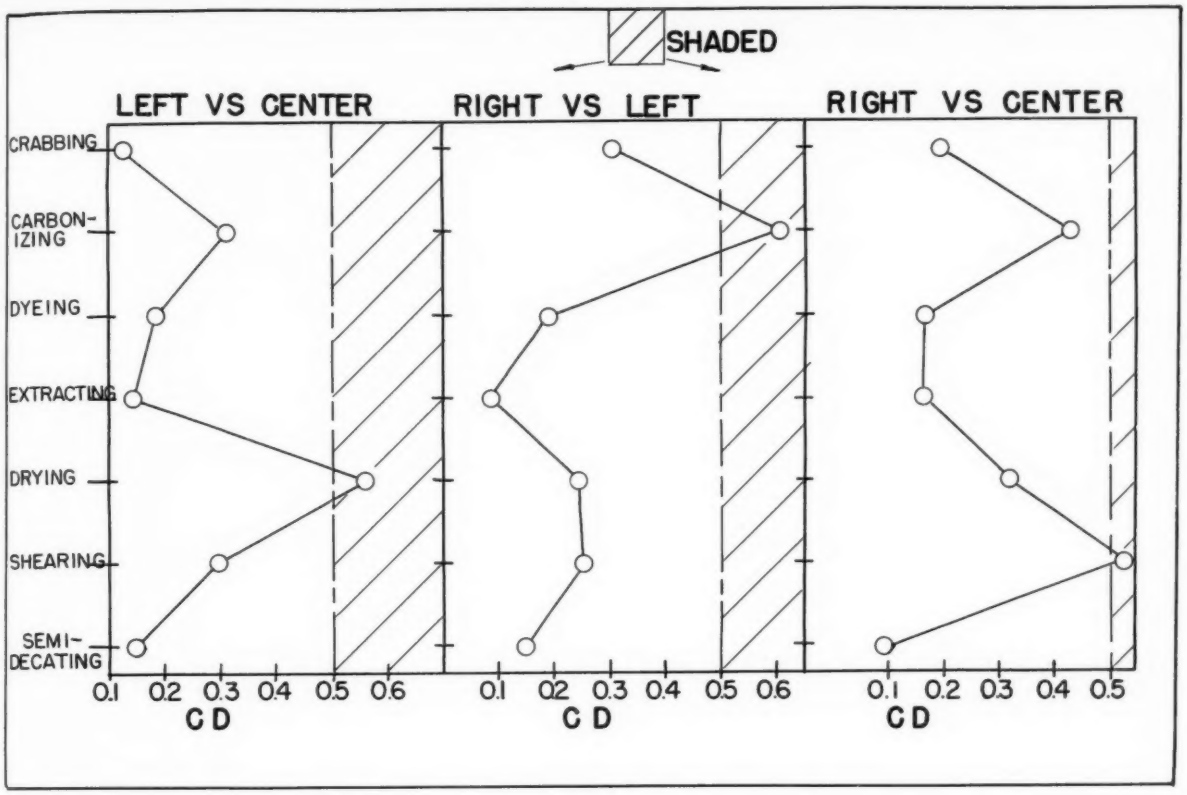

Figure 5
Shadiness as a function of process

tains very interesting information concerning frequency, nature and magniture of shadiness as a function of process. This is a useful tool in trouble shooting and quality control.

CONCLUSION

The method outlined above is not considered the last word. It has proved useful. A great deal of activity is currently in progress among those concerned with developing better color difference formulas. At times one feels as if this search is in the realm of the perpetual motion machine, but it is certain that some progress is being made. The attempts to produce formulas which appropriately weight variations in different directions in some color space have had a long history. There are several classical papers in the field. It is felt that improved formulas, both from the point of view of being more easily solved and of giving more nearly uniform tolerances in different regions of the color domain will appear. These should not alter the basic procedure used here, but rather only the tolerance value and the need for different tolerances for different regions. As all of our experimental data are on file in terms of CIE data, at worst, a new formula would require recalculation to re-establish the tolerance.

It is hoped that others may have occasion to employ the technique as outlined, particularly in other sections of the textile industry. It is most probable that the color difference values given here as tolerances are not universal. Much more data must be analyzed before this procedure can really be free of question. However, these results have been obtained over a considerable period of time and a number of geographically different mills, consequently, the author feels that considerable faith can be attached to the magnitudes involved.

Finally, and of considerable significance, is the fact that several in-

(*concluded on page P415*)

TABLE I
Sample Calculation Showing Piece Shaded Right Side to Center

$$CD = 40 \left\{ \left[0.23 \Delta V_y \right]^2 \left[\Delta (V_x - V_y) \right]^2 \left[0.4 \Delta (V_z - V_y) \right]^2 \right\}^{\frac{1}{2}}$$

Sample		Right		Standard		Center
	Average of 4 Readings			Average of 4 Readings		
X =	.3183	V_x	6.203	X = .3126	V_x	6.154
Y =	.2804	V_y	5.823	Y = .2763	V_y	5.786
Z =	.1855	V_z	4.517	Z = .1826	V_z	4.487
	V_y		5.823	V_y		5.786
	$V_x - V_y$		.380	$[V_x - V_y]$		.368
	$V_z - V_y$		−1.306	$[V_z - V_y]$		−1.299
	V_y		.037	$[0.23\ V_y]^2$		.000072
	$\Delta(V_x - V_y)$		.012	$_x\Delta(V_x - V_y)^2$		.000144
	$\Delta(V_z - V_y)$		−.007	$_z0.4\Delta(V_z - V_y)^2$		.000008
				SUM		.000224

$$CD = 40 \times .015 = 0.600$$

Piedmont Section——

COTTON TEXTILES: AN OVER-CAPACITY INDUSTRY?*

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INTRODUCTION

OVER-CAPACITY is a term that we in the textile business have heard a number of times over the years. Public speakers, magazine and trade papers, and our own technical analysts have had much to say on the subject. In my opinion, it is extremely timely for us at this particular time to consider over-capacity in our industry.

In my discussion with you, I will attempt to touch on the many factors which must be considered in connection with over-capacity. I also hope to boil down into a mathematical statement just how much, or how little, over-capacity has existed in the past, does exist now, and may exist in the future.

First, let me explain that I am discussing over-capacity in the cotton textile industry, rather than the textile industry as a whole. I do have in mind man-made fibers, as well as cotton, but I shall exclude wool and silk since they are further removed from our own operations.

Just what do we mean when we say "over-capacity of the cotton textile industry?" In general, over-capacity exists when the total productive capacity is more than the demand made upon us by the public for our products.

We have productive capacity on one hand and a demand on the other. In terms of capacity to produce, we must keep in mind the equipment we have, the hours and efficiency at which this equipment is operated, and the available labor supply.

We will probably get a clearer picture of this subject if we consider it in three parts: 1) what has occurred in the past, 2) what is occurring now, and 3) what the future looks like.

A LOOK AT THE INDUSTRY

To form a backdrop for the evaluation of the main factors, let us look at the size and complexity of the cotton-textile industry.

Considering the entire textile industry (cotton and all other fibers),

W E Clark

in the year 1952, it ranked sixth in terms of workers employed, with 1.1 million employees, and ninth in value added by manufacturing, with $5.3 billion. The cotton-textile industry constitutes a major division of this total. Therefore, you can readily see that we are a large industry in the greatest industrial country in the world today.

Our products are sold both to the consuming public and to industry. I expect that we are one of the few industries in the country that can claim as its customers every single American, every one of the 165 million people in our nation.

We supply a customer from the cradle to the grave—you might say from the diaper to the casket lining.

Our retailers obtain their materials from some 31 thousand cutting and sewing plants. These plants, in turn, are supplied by some 763 cotton mills through converters, cloth brokers and finishing plants.

The channels from raw form to the ultimate consumer are varied and subject to many pressures of change affecting the success of each segment of the industry. Our products are supplied from many individual companies, no one of which exceeds approximately 5% of the total spindles in place for our industry. Our products must meet not only the many functional requirements of our customers but also their desires and wants in terms of style and fashion.

Our raw materials come from many sources. In terms of our major raw material (cotton), its supply and price is influenced by a number of factors ranging from weather conditions to political considerations.

Wrapping this up into one picture, it takes the shape of a very complex industry. It is a picture which should be kept in mind when talking about over-capacity.

THE PAST

In looking over the past 30 years, one sees that the year 1925 represents the high-water mark in number of spindles, with 37.9 million spindles in place. Since then the number of spindles has been reduced. During 1954 there were only 22.7 million spindles in place. This is a decrease of 40%. In fact, in the 30 years since 1925, there was only one year (1945) when there was no net loss in number of spindles. However, during this same period it should be noted that, although some 26.5 million spindles were junked, some 11.5 million new spindles were added.

During this same period there has also been a tremendous increase in the hours of operation. Prior to World War I the industry was operating on a one-shift basis. During the war the total demand upon the industry required a two-shift operation. After World War I, much of the industry remained on a two-shift basis, which was stepped up during the late 1930's and early 1940's to virtually a three-shift operation. This resulted in a substantial increase in spindle hours operated.

In addition to increased hours, many technological improvements have been made which increase the yield per spindle of our equipment. These improvements have resulted in higher machine speeds, larger ring sizes, more efficient drafting equipment, increases in automation, etc. Such improvements in the 15 years between 1923 and 1937 alone made it possible for us to reduce by 17% the number of spindle hours required to process one bale of cotton.

Now let's switch from the capacity-to-produce side of the equation to the consumption-and-demand side. Our principal fibers are cotton and the

* Presented at the Annual Meeting of the Piedmont Section on October 29, 1955 at the William Barringer Hotel, Charlotte, NC.

man-made fibers. Taking representative periods over the past 30 years, the United States civilian per capita consumption of cotton was as follows:

1925—1929	23.4 pounds
1935—1939	22.5 pounds
1945—1949	24.2 pounds
1950—1954	24.3 pounds

In other words, we have had a relatively stable consumption of cotton per capita.

During these same periods of time, the man-made fiber consumption per capita was as follows:

1925—1929	.8 pound
1935—1939	2.6 pounds
1945—1949	6.1 pounds
1950—1954	8.6 pounds

Total civilian consumption per capita for both cotton and man-made fibers thus increased from 24.2 pounds during 1925-1929 to 32.9 pounds during 1950-1954—an increase of approximately 36%.

During this same period the total population of our country increased from about 115 million people in 1925 to the present 165 million. Considering the increases in per capita consumption and total population, this meant a tremendous increase in demand upon our productive facilities.

It is significant that, even though the use of man-made fibers has increased tremendously, cotton consumption per capita has remained relatively stable. At the same time that synthetics have replaced cotton for some purposes, we have found new uses for cotton elsewhere. As an illustration, during the period 1945-1949, approximately 1.8 pounds of cotton tire cord were consumed per capita. As you know, that has been almost completely displaced by rayon and nylon. However, while this was taking place, we have increased usages of cotton in other markets, such as cotton tufted floor covering, tufted spreads, etc.

Have we then, in the cotton textile industry, had over-capacity in the past? Considering both cotton and man-made fibers and expressing this in terms of percent to capacity required on the basis of a 2½-shift, 5-day week operation, to meet demands we have the following picture:

1925	50% of capacity required
1935	50% of capacity required
1945	95% of capacity required (high military demand)
1954	102% of capacity required

I think we will all agree that we have had over-capacity for the past 30 years, but substantial improvement has been made, as indicated by these figures.

What this over-capacity has meant to our industry in the past is familiar to all of us. Except during periods of unusually high demand, we had a productive capacity far in excess of the demand for our products. This meant that, during periods when a drop-off in demand occurred, the markets were generally flooded with excess goods. Under these conditions, although quality still had to be built into the product, price became the determining factor in making sales.

To keep our plants in operation at times, prices for our products were accepted which were not satisfactory in terms of healthy, profitable operation. Because we are an industry made up of many companies competing with each other for their share of the markets, the many delicate balances between productive capacity and consumption demands could not be kept in proper relationship.

THE PRESENT

Now to the present.

I believe that right now we are standing on the threshold between a past era of over-capacity and a future era which *could* be one of under-capacity. In fact, using the same mathematical calculation we applied to past operations, we find that 110% capacity was required to meet the demands for our products during the first six months of 1955.

Aside from this more favorable balance of productive capacity and demand for our products, let's consider a few developments in our industry at the present time which will result in still greater demand for products from our mills. We now have an intense rivalry between the cotton and the man-made fibers. These newer, man-made fibers are finding their way into both industrial and consumer goods.

The research, development, and promotional work all along the line is intense and directed toward further increase in the usage of these man-made fibers. Desired functional and styling requirements are being met as a result.

This intense competition from man-made fibers has resulted in each segment of the cotton textile industry taking a new look at cotton. This new look extends from the growing of the fiber through the production, finishing, and promotion of cotton products. Development work is being directed toward the blending of man-made and cotton fibers to bring to the finished products the best characteristics of each.

Among the man-made fibers, and to some extent among cotton fibers, we are witnessing a trend toward trading up to better-finished products. This in itself will result in better opportunities.

We are also witnessing the introduction generally of better principles of scientific management. These principles are being applied to production, research and development, and marketing and sales. The continued use of these tools will result in more efficient operations, the production of better quality goods, a stimulation toward increased consumption by the public, more reliable facts for decision making, and a better understanding of management controls. All of these are necessary to keep our productive capacity in better balance with the demands of the consumer.

We are taking a closer look at people's changing living habits. People are spending more time off the job. Hours are shorter, vacations longer. This greater leisure time has created a boom in travel and in activities around the home. Casual clothes are preferred for auto travel, for sailing, gardening, do-it-yourself projects, even for such passive pursuits as TV watching.

The people want to live informally, and the textile industry is gearing itself to meet their clothing demands. The trend is toward comfort and color, not only in what people wear, but also in their furniture, their home decoration, their cars.

The textile industry, long used to gearing its production to meet changing styles for women, has now accepted the fact that children and young ladies also want to be dressed in the styles of the moment. And today, the men and the boys are getting the attention of the style setters. Last year's charcoal gray must make way for the lighter gray. Even the controversy of the squared-off handkerchief vs the pointed handkerchief creates demand, and that creates sales in the clothing business.

And there are still more opportunities for clothing development and promotion. The office worker who wears a cool, colorful sport shirt at home over the weekend is longing to be liberated from the tight collar and stark business suit of the Monday-to-Friday shift. Great strides have been made in cooler, more comfortable suits, but still more work remains. Who knows but what the man who someday may revolutionize office wear might be right here in this room?

It is up to the cotton textile industry to assert its leadership in making people more conscious of their need for better, more comfortable, more

stylish products, not only in clothing but in everything we turn out. And the channels of communication are here for us to use. Not only do we have advertising, but many magazines and newspapers are now featuring editorial pages on men's and boys' wear to bring new styles to the attention of the consumer.

THE FUTURE

From where we stand now, how does the future look for us in the cotton textile industry? Looking at the overall economy of the nation, business and economic analysts may not agree about things over a short period of time, but they all seem substantially in agreement in their long-term outlook for the next ten years. By 1965 our total population should increase from about 165 million people to 190 million. Civilian employment will increase roughly 21%. Industry in general will raise its capacity to meet the increasing demands of the consumer, and disposable income of the consumer is estimated as increasing approximately 50%. Other growth factors could be cited; however, these few will serve to illustrate the point. Within the framework of this general expansion, we in the cotton textile industry can look forward to much greater demand for our products.

Let's assume that our present military, export, and civilian per capita consumption of cotton and man-made fibers remains as is, that our productive capacity in the industry remains as is, and that the only increase in demand upon our industry for our products will be through increased population. Then, on a 2½-shift, 5-day basis, we will be operating in 1965 at 126% of capacity. Stating this another way, to meet the requirements of these additional 25 million consumers it will require equivalent operation of 3.5 million spindles. This, I believe, is a conservative estimate, because we know that the man-made fibers will increase substantially and that intensified efforts toward cotton development and promotion might well increase per capita consumption.

During this gradual period of growth it will be necessary to increase the capacity of the cotton textile industry. This might come about through the addition of spindles and equipment, or faster replacement of present machinery with more efficient equipment. Most likely it will be a combination of the two. I believe, too, that with all the present management tools at our disposal and with a reflective eye cast back to the past period of overcapacity, these additions will be made in a manner which will avoid the mistakes of the past.

The percent-to-capacity information which I have presented in my talk included production for civilian and military uses, as well as for export. I have assumed that roughly the same relationship of exports to imports will exist in the future as has existed in recent years. However, as you well know, there has been a sharp step-up in Japanese textiles exported to the United States, and past percentages may have little or no meaning in the light of the current situation.

For example, responsible individuals in the textile industry have been very much concerned about the sharp drop in tariff rates which was a major factor in the recent increase in Japanese imports. Secretary of Commerce Weeks attempted to minimize this concern by referring to the 1954 Japanese imports, which amounted to only about one-eighth of the cotton goods which were exported from this country to Japan. The industry has recently pointed out to Secretary Weeks that the 1954 situation was entirely different from the situation which now confronts us. During the first six months of 1955, for example, Japanese exports of bleached, unbleached, printed or dyed, and velveteen fabrics ran sixty-one percent over their exports to us during 1954. Household items, including table napery, sheets, pillow cases, and towels are running twenty-seven percent higher than 1954 totals. In wearing apparel, the increase has been greater. The first six months of 1955 indicate that imports of knit outerwear shirts and wearing apparel are running five times higher than 1954. During this same period our exports to Japan have dropped sharply. It is inconceivable that our Federal Government will not eventually adopt a sensible and realistic approach to this problem. It is, however, obvious that some responsible officials in the Government service are looking at statistics which are not up-to-date and are now comparing the older import figures with the current improvement which is being realized in textile manufacturing.

It seems perfectly obvious, except to the Government officials responsible, that continuation of this unrealistic policy will have severe repercussions upon the textile industry and the economy of this country as a whole. Japanese textile mills are new; contain the best of modern equipment; are well laid out; and are comparable to the best in the world. They are now equipped to produce high-styled, high-quality fabrics comparable to the best anywhere. Until recently, many manufacturers in this country were inclined to be rather complacent about Japanese competition because of the historical evidence that Japanese goods were poorly made and sold only on a low-price basis. That situation has completely changed because of the change in the nature of distribution of Japanese goods. They no longer have their markets in the Far East, where living standards are low and goods have to be sold cheap in order for them to move in volume. They have now stepped up their styling and quality to compete in the American and European markets where the consumer requires the best in style and quality. However, with wage rates in Japanese textile mills at ten to twelve cents per hour, it is perfectly obvious that they can upgrade their quality and styling and undersell manufacturers in this country or in Europe where wage levels reflect the standard of living prevalent. The major commodity in Japan is its low-cost labor. The Japanese program is dedicated to using more and more of this low-cost labor force in producing high-quality goods, which always call for more man hours per pound. I am convinced that the United States Government must and will take adequate action to protect the jobs of American textile workers. I am glad to note the aggressive statements being made by practically all of the Southern Congressmen in support of quota restrictions as a positive step to prevent the replacement of American workers with cheap Japanese labor.

Assuming that adequate action will be taken to correct our export-import problem, I am particularly optimistic about the economic health of our industry. You gentlemen may not have a major responsibility toward maintaining the proper productive capacity in our industry. However, you do have a very important responsibility in connection with stimulating increased consumption of our products through ever better dyeing and finishing.

Likewise, every person in every design room, laboratory, office, and mill has a responsibility and a part to play toward keeping the public interested in buying our products. It may be quality, workmanship, or a smarter-looking, more colorful-looking piece of fabric that turns the customer's eye, but the net result is one of satisfaction in our products.

(*concluded on page P415*)

Southeastern Section——

THE APPLICATION OF VAT DYES TO ACRILAN AND TO ACRILAN-RAYON BLENDS*

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It is emphasized by the authors that properly applied vat dyes are even faster to light and washing on Acrilan than on cotton or rayon. As examples, the Vat Yellow GC type is said to show excellent fastness to light on Acrilan and the indigoid vats to show excellent resistance to chlorine. The other fastness properties on Acrilan are also reported to be very good.

A progress report is given by the authors of some laboratory work on the application of vat dyes to 100% Acrilan and to Acrilan-rayon blends. The dyeing of 100% Acrilan appears to be well in hand, and some very promising results have been obtained on the rayon blends.

INTRODUCTION

IT should be stated at the outset of this paper that the information given is to be regarded in the nature of a progress report. Most of this discussion is based on the results of laboratory trials, and much more work remains to be done before these procedures may be labeled "commercial." However, these trials have shown a great deal of promise and a few successful commercial-scale dyeings have been carried out on 100% Acrilan which indicate that little difficulty will be encountered in translating these laboratory results to the plant.

100%—ACRILAN DYEING GENERAL DISCUSSION

The first work on the application of vat dyes to 100% Acrilan was carried out by the various dyestuff manufacturers in cooperation with our own group. The General Dyestuff Company should be cited especially for their pioneering work in this field, and we gladly acknowledge our indebtedness to them. Their work established the general usefulness of vat dyes on Acrilan, and the basic procedures for their application. Our own work represents an extension and simplification of their techniques.

PRINCIPLES——There are two main factors to be borne in mind in translating the vat dyeing of cellulosic fibers to the vat dyeing of Acrilan acrylic fiber. First, it is a highly oriented hydrophobic fiber and will not soak up dye solutions, like a blotter, as the natural fibers will. Dye liquors must be forced into the fiber or else only the surface of the fiber will have a chance to remove dye selectively from these dye solutions. The most practical means of forcing dye into the fiber is to raise the temperature above the boil. At a temperature of around 230°F the diffusion of dye into the fiber takes place at a satisfactory rate, so that fully penetrated dyeings can be achieved in one hour or less. Pastel and light shades can be satisfactorily dyed at temperatures below the boil, but cross sections of the fiber will show that only surface dyeing has been obtained.

Secondly, it must be remembered that Acrilan is an acrylic fiber. Like all fibers of this type, it can be degraded by prolonged exposure to very hot caustic solutions. We are not sure just what the permissible upper pH limit is, but we have found that entirely satisfactory dyeings can be obtained at a pH of 10.0. Prolonged exposure of the fiber at this pH to a temperature of 230°F can be tolerated without damage, so that we have arbitrarily settled on this pH as being the proper one for the vat dyeing of Acrilan. As the color value at this pH is also slightly better than that at higher pH values, 10.0 appears to be a good choice. Incidentally, the color value of the vat dyes on Acrilan is equal to, or slightly better than, that obtained on rayon by the recommended rayon-dyeing procedures.

It will be recognized by those of you familiar with vat dyeing, that we have departed radically from the conventional procedures by imposing the above two restrictions on the dyer. He must dye at high temperatures and he must not dye at a pH higher than 10.0. He knows that he needs caustic to dissolve the vats, that his reducing agent, sodium hydrosulfite, is not stable at elevated temperatures, and that many of his dyes are also unstable at temperatures above 140°F, not to mention what happens at 230°F. How, then, is he supposed to apply these dyes?

I think most of you can guess what the basic secrets are: 1) you must use a milder alkali, such as sodium carbonate, 2) you must use a reducing agent that is stable at elevated temperatures, such as sodium formaldehydesulfoxylate, and 3) you must select dyes for maximum temperature stability or, where necessary, protect the dye from over-reduction by the use of some agent, such as dextrin. In this connection, I think it is very important that we all remember that our knowledge of vat dyestuffs is practically all based on the conventional caustic-hydrosulfite system. For example, we do not know just how stable vat blues of the BCS type are at elevated temperatures in the presence of sodium carbonate and sodium formaldehydesulfoxylate.

APPLICATION——The most satisfactory procedure which we have tried for the application of vat dyes on 100% Acrilan is illustrated by the following formulation:

Dyeing formula for medium blue shade on 100% Acrilan

Liquor Ratio: 20:1
5% Indigoid Vat Brill Blue 4B (CI 1184)
10% Na_2CO_3
10% Sodium formaldehydesulfoxylate
2% Monopol Oil

The vat dye is pasted with the Monopol Oil and added to the cold dyebath contained in the expansion tank of the package or raw stock dyeing machine. The carbonate and sulfoxylate are dissolved separately and added to this bath with stirring. The full bath is then allowed to flow into the dyeing chamber by gravity flow, before starting up the circulating pumps. Circulation is then carried out, preferably in alternating cycles of inside-out and outside-in, for about 20 minutes while the temperature is raised to 205°F. Reduction is generally good at this point for the indigoid type of vat dyes so that one can proceed immediately to the high temperature dyeing cycle. This is done by

* Presented by E D Smith at a meeting of the Southeastern Section in the auditorium of the Alabama Power Company in Talladega, Ala, Saturday afternoon, February 12, 1955.

cutting off the external circulation, and raising the temperature in about 15 minutes to 230°F. Dyeing is continued at this temperature for 30-45 minutes after which the bath is cooled to below the boil and dropped. The dyed stock is then given a hot running rinse which, in contrast to its action on cellulosic fibers, only removes surface dye without removing adsorbed dye since the leuco vats are quite fast to washing on Acrilan.

As indicated above, the anthraquinone types of vat dyes will often not reduce by this procedure. In these cases satisfactory reduction has been obtained by the addition of 1-5 percent of sodium hydrosulfite and/or sodium hydroxide. Where the use of sodium hydroxide is required, an equivalent amount of sodium bicarbonate was added to readjust the pH to 10.0 before proceeding to the high temperature part of the dyeing. This is necessary to avoid degradation of the acrylic fiber.

OXIDATION —— The oxidation of vat dyes on Acrilan also requires higher than normal temperatures. Good results have been obtained by combining the oxidation and scouring steps as follows: The stock is treated with 0.1% $NaBO_3$ solution for a period of 10 minutes at 160°F. Approximately ½% of a synthetic detergent is added, and the temperature is raised to 200-205°F for an additional 20 minutes.

The above procedures are quite general, and, as usual, some vat dyes require special treatment. Since the indigoid types are generally easier to reduce and have better penetrative properties than anthraquinones, we have concentrated our attention on them. Inasmuch as these indigoid types have excellent all-round fastness properties, including chlorine fastness, we expect that they will generally be used except in certain shades, such as green or yellow, for which there are no suitable indigoid types. The smaller-molecular-weight anthraquinone types will occasionally offer improved fastness properties, however, and we have applied a number of these without difficulty. Typical fastness properties of a number of vat dyes applied to 100% Acrilan in the manner indicated are summarized in Table I.

TABLE I

Fastness Test Results of Vat Dyed Acrilan Staple

Dye and Percent	Fade-Ometer[1]	Crocking		Washing[2] @ 160° F	Perspiration[2]		#3 Chlorine bleach
		Wet	Dry		Acid	Alkali	
5% Ahcovat Flavone GC Pst (Pr O)	80	5	5	5	5	5	5
5% Algol Orange RFN Pst (*CI* 1217)	80	5	5	5	5	5	5
10% Sulfanthrene Pink FFS Pst (Pr 109)	160	5	4	4	4	5	4
5% Sulfanthrene Red Violet 2RN Pst (Pr 503)	160	5	5	5	5	5	5
5% Sulfanthrene Blue 2B Dbl Pst (*CI* 1184)	80	5	5	5	5	5	5
5% Ahcovat Jade Green BDA Dbl Pst (*CI* 1101)	160	5	5	5	5	5	5
20% Algol Deep Black BDA Conc Pst	160	5	4	5	5	5	5

[1] Standard Fade-Ometer hours to produce "just appreciable" fading.
[2] Shade change and staining ratings.

ACRILAN-RAYON BLEND DYEING—GENERAL DISCUSSION

As many of you probably know, the package dyeing of blended Acrilan viscose-rayon yarns is already being practiced to a considerable extent. Good fastness properties are being obtained by using disperse (acetate) or acid dyes for the Acrilan and after-treated direct dyes for the rayon. In some instances, however, still better fastness properties are desired, and we feel that eventually the vat dyeing of these blends will become important. It was at first hoped that union shades could be obtained with the same vat dyes for both fibers, but this goal now appears to be a long-range one.

Preliminary trials have shown that the indigoid types, which are preferred for Acrilan, in general only lightly stain the rayon component of the blend under the conditions suitable for dyeing the Acrilan. On the other hand, the anthraquinone and sulfur types of dyes, again under the conditions required for Acrilan dyeing, generally only lightly stain the Acrilan. A few dyes of the anthraquinone class are known, however, which give a good union on the blended fibers. It is a very fortunate circumstance that the Jade Green and Yellow GC types are among those that dye both fibers under the same conditions, since there are no indigoid types of comparable shade and brightness.

PIGMENT CIRCULATION, REDUCTION —— Tentatively, therefore, we propose the approach presented here for the union vat dyeing of Acrilan-rayon blended yarns. Dyeings will include both classes of vat dyes: indigoids for the Acrilan and anthraquinones (or sulfurs where necessary) for the rayon. Again it is preferred to disperse the pigments through the stock before reduction in full liquor ratio. Reduction is effected with sodium formaldehydesulfoxylate in the presence of soda ash as outlined previously. Since the anthraquinones often require more extreme conditions for their reduction than do the indigoids, it is anticipated that some hydrosulfite or even small amounts of caustic soda may be required at this point when anthraquinone dyes are employed. If NaOH is required for reduction, the pH should be adjusted to 10.0 again before proceeding to the high-temperature part of the dyeing. This can be readily accomplished by simply adding an amount of sodium bicarbonate equivalent to the NaOH necessary for reduction. We have not yet had much experience along these lines, but have so far not encountered any difficulty in reducing most vat dyes with carbonate, sulfoxylate, and hydrosulfite alone. In this case, no pH adjustment is required. When proper reduction is obtained, the external circulation is closed off and dyeing is carried on at 230°F as before. The best use of the rayon dyes will be obtained by cooling the bath to about 140-160°F before dropping it, and, if desired, external circulation can again be used and NaOH and hydroxulfite may be added to maintain reduction. This will not damage the Acrilan physically, nor will it cause any appreciable loss of dye from the Acrilan. The rinsing operation should be carried out in the manner that is normal for rayon, since a hot rinse, which is normal for Acrilan, may cause an appreciable loss of dye from the rayon.

OXIDATION —— The oxidation process also must be carried out with the rayon component in mind. Oxidation is begun at room temperature with a 0.1% solution of $NaBO_3$, the temperature being raised to 130°F and held there for 10 minutes. This is suf-

ficient to oxidize the dye on the rayon so that detergent can be added and the temperature raised to 200°F to complete the oxidation and simultaneously to scour the fibers free of surface dye.

EXAMPLES —— As will have been gathered, the above ideas represent some very recent work, and we have not yet had time to evaluate them fully. A typical dyeing resulting in a good union shade may, however, be cited as follows:

Dyeing formula for Dark Blue Shade on 50/50 Acrilan-rayon

Liquor Ratio: 20:1
5% Brill Indigo 4BR Pst (CI 1184)
5% Immedial New Blue FBLA Ex Conc Pst (Pr 285)
10% Na_2CO_3
10% Sodium formaldehydesulfoxylate
2% Monopol Oil

Dyeing is carried out identically with that outlined previously for 100% Acrilan. Better color yield on the rayon component is obtained, however, if the exhausted bath is cooled to about 140°F before dropping. A cold rinse with 20% salt is also recommended to minimize removal of color from the rayon. Oxidation and scouring is likewise modified from that given for 100% Acrilan as indicated in the general procedure for Acrilan-rayon blends. The resulting dyeing will show a good union between the Acrilan and rayon components of the blend, but the fastness properties will be somewhat reduced due to the relatively poor fastness of the sulfur dye on the rayon. Omission of either the indigoid or the sulfur dye will result in only a light stain on the Acrilan or the rayon component respectively.

It is of interest to note that two anthraquinone vat dyes are so far known which will union dye Acrilan-rayon blends under the conditions outlined above. These are Anthraquinone Vat Jade Green (*CI* 1101) and Anthraquinone Vat Navy Blue RT (*CI* 1100). These two dyes have quite similar structures which may be a lead toward discovering other dyes useful for this purpose. No completely satisfactory yellow dye has yet been found, but the Flavone GC type gives a reasonably close union and fair fastness properties. This latter dye is rather difficult to reduce, however, and the degree of union appears to be markedly affected by the dyeing temperature.

The degree of union dyeing obtained can be checked very simply in exploratory runs by packing the cage of the dyeing machine with alternate layers of Acrilan and rayon staple. As the two fibers have quite different shrinkage characteristics, they can be removed as separate layers after dyeing is completed. We have found this procedure to be quite useful in adjusting our dyeing formulas before attempting to apply dye to a yarn package. The degree of union obtained on blended yarns can also be checked, however, by selectively dissolving each fiber from the blend. Treatment of the dyed yarn for 20 minutes at 160°F with a 100:1 volume of dimethyl formamide effectively removes all of the Acrilan, while a cold treatment for 10 minutes with concentrated hydrochloric acid serves to extract the rayon component of the blend. The effect of these agents on the color of the residual material should be checked, of course, but generally little or no effect has been noted.

CONCLUSION

In conclusion, I believe we may say that the results of our work to date are very promising. It would appear that we are ready for commercial trials in the case of 100%-Acrilan dyeing with vat colors, but that much more laboratory work remains to be done with the union dyeing of rayon-blended yarns.

Color Gradients——

(*concluded from page P409*)

struments and various procedures have been developed to measure larger areas of a sample. In so doing it has been hoped, by the proponents of such methods, that one would thereby obtain results which more nearly duplicate the apparent averaging or integrating effect of the human observer. It is the writer's opinion that such an average obtained by rotation or examining a larger area is much less informative than several measurements at various points.

The reason for this opinion is the feeling that the variation or "scatter" is a more informative statistic than the mean. That the variance is of considerable mathematical importance in any statistical study is well known. This is a property of colored textiles (and other materials) which is virtually unobtainable visually. It could probably be safely stated that in its ability to evaluate this statistic, color measuring equipment performs one of its most useful functions.

ACKNOWLEDGMENTS

The author would like to acknowledge the aid derived, in developing the concept of this paper, from the personnel of J P Stevens & Co Inc (Woolen and Worsted Division), Talbot Mills Inc, and North Billerica Company. Further, many of the detailed calculations were prepared by Miss T R Commerford of this laboratory.

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(2) Davidson, H R and Imm, C L, *J Opt Soc Am* **39**, 942 (1949).

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Cotton Textiles——

(*concluded from page P412*)

SUMMARY

In summary, I have attempted to point out that, in my opinion, the future is very bright and will require expansion in our textile productive capacity, that the present reveals a far better balance between productive capacity and consumption, and that the past very definitely shows a considerable over-capacity in our industry. Let us work toward keeping this matter of over-capacity in the past tense.

As to the future, I think it is obvious that the brightest future is reserved for those companies and those people who, faced by tough competition, operate in the most efficient, modern manner, and do the best job in terms of customer satisfaction, even though it may mean radical changes from the way things were done in the past.

I believe that those who look ahead will move ahead.

Minutes———

188th Meeting
TECHNICAL COMMITTEE ON RESEARCH

THE one hundred and eighty-eighth meeting of the Technical Committee on Research was held on April 20, 1956 at the Benjamin Franklin Hotel, Philadelphia, Pa, with the following members in attendance:

C A Sylvester, *chairman,* M J Babey, *vice-chairman,* J A Woodruff, *secretary,* E C Atwell, C A Baker, J R Bonnar, C W Dorn, B F Faris, A H Gaede, J J Hanlon, A E Hirst, W Klaas, R W Jacoby, E W Lawrence, H E Millson, J E Norton, F J Rizzo, E J Chornyei, R E Rupp, C H A Schmitt, C A Seibert, R B Smith, R H Souther, P B Stam, J G Stass, R L Stutz, G S Wham, Jr, P J Wood, G J Mandikos, G R Thompson, H W Stiegler, R R Frey, L R Burgess, W A Holst, L B Cook, O C Bacon, P J Fynn, H Y Jennings, L L Heffner, M W Goodell C L Simon, T R Smith, S N Glarum, T J Smith, P J Kennedy, J A Doyle, B R Norwick.

Chairman Sylvester opened the meeting by calling upon President Jacoby, who discussed the appointment and activities of the newly formed Archives Committee under the chairmanship of S M Edelstein. TCR members were urged to submit material of historical interest to Mr Edelstein.

REPORT OF THE ECR CHAIRMAN

As chairman of the Executive Committee on Research, C W Dorn reported that he had been authorized 1) to set up a committee for test methods to evaluate fulling agents; and 2) to dissolve the Reference Committee on the Aging of Textiles since there is no test method on the books and the chairman of that Reference Committee has retired.

The subject of Aging of Textiles is felt to be largely covered by the new committee on the Effect of Weathering on Textiles, F J Rizzo, chairman.

It has been recommended that ECR follow through on the recommendations of the Joint AATCC and ASTM Committees that there be an interchange of representatives on related AATCC and ASTM Committees to serve as observers. Details of this interchange are to be worked out by the Committee on Inter-Society Relations.

The setting up of a Reference Committee on the Use of Radioactive Substances as Related to Test Methods has been approved.

The Committee on Color Fastness to Pleating has been reactivated. This Committee is to review the present test methods in relation to man-made fibers. It is felt that this method will need some revision to bring it up to date.

ECR has appropriated increased funds for the further study of the light fastness of textiles in natural light. The National Research Advisory Committee has submitted an extensive report which gives numerous possible projects for committee study. This report is to be reviewed by ECR.

ECR has been brought up to date on the work by the Light Fastness Committee and also the work of the Wash and Wear Committee.

W D Appel was selected to represent AATCC at the recently concluded ISO meetings in England. AATCC's chief interest in the meetings was that of water repellency, and it was decided to present all of the Association's methods of testing for water resistance for consideration as international standards.

The Committee on Definitions has reviewed the British proposals and their findings are now in the hands of Mr Appel.

A discussion was held on the attempts of several organizations to set up end-use standards. AATCC test methods were used as a basis, but in many cases were altered, although still described as "AATCC methods."

In view of this, ECR unanimously passed the following resolution:

"The Executive Committee on Research of the American Association of Textile Chemists and Colorists, taking cognizance of the fact that some organizations performing fastness tests on textiles use tests designated as being standard AATCC test methods, where the methods actually do not conform with AATCC recommended procedures, goes on record as stating that, such different or modified methods should not be referred to as AATCC procedures, and requests that such references be omitted."

AATCC has completed its selection of test procedures recommended for CS 59, and these will be submitted as soon as ASTM completes the selection of its test methods, which are pertinent to that standard.

The blue standards are completed and have been approved by ECR. (A rising vote of thanks and applause were extended to Mr Rizzo for the complete job he did on this particular project).

Director of research H W Stiegler has presented his quarterly report in a new form, which lists each project that is being actively pursued at Lowell, giving the authorization of that project, the date of inception, the estimated cost, cost to date, what has been accomplished to date, the estimated additional work and cost.

The following is a very brief condensation of the Quarterly Report #1 to the Executive Committee on Research.

GENERAL———The first quarter of 1956 has seen marked progress along several lines. Improvement of the technical portions of the *AATCC Technical Manual and Year Book* was given special concerted effort. The Executive Committee on Research and the Technical Committee on Research approved and extended special efforts to implement work on projects and problems instigated last year. Some of these are approaching peak effort as the committees have cleared away preliminary work and submitted plans and materials to the AATCC Laboratories.

Interesting progress was made on such vital projects as Dimensional Changes, Abrasion and Lightfastness. A history of the AATCC Flammability Project was written.

PROJECTS———Active projects worked on in the Laboratories during the first quarter were: Abrasion, Crocking, Dimensional Changes, Flammability, Lightfastness, Nonwoven Fabrics, Simplified Control Tests, Washfastness, Wash and Wear, and Water Resistance.

In addition to the above activities

the Research Division took part of the Atom Bomb exhibit to a symposium at the Quartermaster Research and Development Command at Natick, Mass and to a joint meeting of the New York Section of AATCC and AATT in New York. Preliminary plans for the AATCC Laboratories were discussed and indicated to the Lowell Technological Institute for consideration with respect to the new Research Building in which the Association will have a large area.

STAFF———Early in the first quarter of 1956 the research staff at AATCC Headquarters was fortunate in acquiring the services of G M Kidder as research associate. Mr Kidder has had long experience in the field of textile chemistry, having been formerly with Lever Brothers, in charge of their Lux Laboratories. His immediate assignment was the project on Dimensional Changes. This problem has taken on even greater importance than that of last year and Mr Kidder will handle the increasing requirements of the Committee on Dimensional Changes.

TCR COMMITTEE WORK

Before hearing the specific TCR committee reports, Chairman Sylvester asked for candidates for committees on "Evaluation of Fulling Agents," "Fiber Analysis" and "Identification of Finishes."

DIMENSIONAL CHANGES——R B Smith reported that this Committee envisages a series of tests at processing levels lower than the boil to take into account fabrics which are now washed under conditions characteristic of white sheetings, etc. A second objective is the study of restorability factors. This will be commenced with the use of the Dimensional Restorability Meter.

WATER ABSORBENCY———Mr Smith reported also for this Committee. A meeting of the group was held at the office of Mr Roth on March 1, 1956. The construction of an instrument of the same general type used by Mr Mellor in his work for the Committee was discussed. The design agreed upon for this new instrument should result in improved accuracy and ease of operation. A cost estimate was obtained and this was approved by the Council.

Arrangements have been made for the construction of the instrument, and as soon as it is finished it is to be used for interlaboratory tests.

ANALYTICAL METHODS———P J Wood reported on a meeting held the previous day at which the Committee received reports of subcommittees relative to the effects of variables on the iodimetric, ammoniacal copper, and Rubine R methods. These were the three methods previously reported as being suitable in the Committee's opinion for the analysis of sodium hydrosulfite.

Optimum conditions and desirable techniques were agreed upon for the results of extra experiments in each of these three divisions. Difficulties in sampling and storage were emphasized.

It was agreed that all three methods offered advantages for specific applications and conditions and that all three should be published.

Committee members were assigned the task of writing rough drafts of the three methods before the next meeting.

COLORFASTNESS TO STOVING ———W A Holst reported for this Committee. Tentative Test Method (9A-54), intended to replace Standard Test Method 9-52, was presented to TCR April 30, 1954 and was approved by letter ballot in July, 1954. It appears in the Test Method Section of the *1955 Yearbook*, and since approval and publication has received no adverse comment.

It was proposed that TCR approve adoption as a Standard Test Method, replacing Test Method 9-52 and that the committee be placed on a reference basis. (TCR adopted this proposal).

At the conclusion of this report it was voted to adopt tentative test method 95-54 as a standard test replacing test method 9-52 and that the committee be placed on a reference basis.

ANALYSIS OF FINISHES——B R Norwick reported for the Committee on the Analysis of Finishes on Textiles.

Because of the smallness of samples and mixed nature of finishes, classic methods of analysis have not proved successful in the analysis of finishes on textiles. Additionally, in the past, essentially nonfunctional materials and mixtures were often employed. With the growing use of finishes for specific effects, a widespread use of test methods to evaluate special properties, and a greater technical knowledge within the industry, it is now possible to determine how a finished fabric differs from one unfinished or differently finished. This knowledge immediately limits the probable materials which will be found in a sample and enables a major simplification in test methods. Also the use of modern micro methods, spot and chromatographic tests, ultra-violet and infrared spectroscopy, give a specificity with small amounts not previously available. There still remains a necessity for careful purification of the extracts and for a good knowledge of organic and inorganic chemistry on the part of the analyst. The subcommittee is being broken down into interlocking task groups which will handle specific types of finishes. In this way, one group will handle lubricants, another adhesives, another waterproofers, and so on. A preliminary questionnaire is being distributed to those who indicate an interest in this work. In addition, another unknown finish fabric will shortly be sent out for testing. The previous group of unknowns consisted of a stearamidomethyl pyridinium chloride based water repellent, a carboxymethylcellulose bodying finish, and a melamine-formaldehyde crease-resisting finish on viscose and viscose-acetate fabrics. No finish resisted correct analysis.

ANTISTATICS———S N Glarum reporting.

The Antistatic Committee has been working for the last several months on the problem of developing an accelerated test for determining the stability of antistatic finishes during storage. Fabrics of three synthetic fibers have been treated with a variety of finishing agents and are undergoing reistivity tests periodically while stored at different conditions of temperature and humidity. A great mass of data has been collected, which requires analysis. However, the samples stored under "normal" conditions have not shown significant changes in resistivity during the time the tests have been in progress, so it will be necessary to continue the program for a much longer time before it will be possible to recommend conditions for accelerated testing.

COLORFASTNESS TO LIGHT ———C H A Schmitt reporting.

This special task group has been working since October, 1954 in a study on the causes of irregularities in the fading evaluation of sunlight tests. The regular Light Committee has been working on this problem ever since 1950 and they, as well as workers outside the Committee, have found many reasons for these irregularities. They have reported on such

factors as the effect of temperature and humidity.

In the first series of tests, which were run from July 1955 through to February, 1956, it was definitely proved that the present sunlight or daylight test method is not properly interpreted and is the cause of improper rating of color fastness, poor reproduceability at individual test stations, poor correlation between different test stations and, of most importance, the cause of many difficulties when one tries to correlate Fade-ometer against sunlight results and vice versa.

The reasons for this are the following: First, the rating of color fastness in terms of sun hours is the prime fault because sun hour, on the present interpretations, is extremely variable.

Second, the variable just cited is based on the erroneous belief that fading of dyestuffs takes place only during so-called sun hours of that level of solar intensity prevailing above a threshold of .823 Lanniers per square inch per centimeter per minute when recorded on the empty heliometer.

Third, because more commercial testing stations are not equipped to exclude all radiation below this special level from impinging on the samples except when and where sunlight intensity is steady and not continuously interrupted by cloud conditions, samples are often exposed to many Langley Units which are not included in the computation to make up this so-called sun hour.

As fading is in direct relation to a number of Langleys, it stands to reason that a sun hour of 50 Langleys will not cause the fading of a sun hour of 80 or 85 based on the present system of calculating this sun hour. Under these conditions, good reproduceability at individual or different stations is impossible without lengthening the test period to allow for only putting out the samples when one is assured of continuous light intensity and freedom from clouds.

Tests made by individual committee members over a year ago proved that dyes definitely do fade at levels well below this theoretical threshold level of .823.

It has been proved definitely that fading takes place at intensities as low as 0.1 gram calories per square inch centimeter per minute.

The L-1 series covered a study on the use of Langley units as a measure of exposure rather than the variable sun hour, and it appears to have greater merit in solving the problems previously cited, because tests on 33 different colors, which also included blue standards, showed excellent correlation in different locations when exposed to given numbers of Langley Units.

It also showed good correlation when tests were run on a 24-hour daylight basis over a so-called threshold basis, sunlight basis, between the hours of 9:00 to 3:00, or when solar intensity was above that so-called thermal level, above .823.

And finally it was noted that there was very good correlation between all of these four as cited previously, indicating that, regardless of the location or the method of exposure, the results are extremely close.

It is the hope of the Committee that it can recommend to AATCC the adoption of a single daylight test, one which will be adequately defined and thereby bring the method of light testing in both Europe and the USA into complete unity.

BLUE STANDARDS———F J Rizzo reported on the new blue standards as follows:

"The basis of my recommendation yesterday for the adoption of the new blue light fastness standards is given largely on the analysis of the exposures which were made in the standard lamp at the National Bureau of Standards.

"It is hoped prior to the next meeting of the Technical Committee on Research that we will have the final report on this material."

WEATHERING OF TEXTILES ———Mr Rizzo reported as follows:

"We felt that our first job lay in the first category, ie, the color fading, and it was to calibrate the equipment that we have and to find some correlation between the various models of weathering equipment which are available in the industry at the present time.

"Secondly, we wanted to try the use of the Bureau of Standards papers and then we wanted correlation studies, using our Blue Light Fastness Standards. For your information, the present booklet on the Blue Standards sets forth that the Blue Standards can be used for weather. It was not actually tried out and it was predicated on the basis that the dyes which had been used were not expected to bleed. We hope to straighten that matter out with the Light Fastness Standards which we now have."

WASH AND WEAR———G S Wham reported on this subject. He said, in part:

"The wash and wear business is probably the biggest promotional idea that has ever hit the textile industry. Few developments in the textile industry have been promoted with such utter abandonment of the facts involved. Much of this promotion can be attributed to the lack of standardized test methods by way of learning just what is truly wash and wear merchandise.

"There is urgent need for test methods in this area, and action should be taken to establish them by the present Wash and Wear Committee of the AATCC.

"Within the Wash and Wear Committee there are three presently working subcommittees: the Fabric Committee, which is responsible for the selection and procurement of the fabrics used in the study; the Laundering Technique Committee, which is responsible for the development of the service, trials and test methods that we have investigated; and the Evaluation Committee, which was set up to evaluate the results of the test trials that were conducted.

"As a result of the experimental work conducted to date, the Wash and Wear Committee has prepared a suggested test method which we would like to recommend to the Technical Committee on Research as a method to be considered for a period of time by various interested members of the AATCC with the hope that we might get a further evaluation of the degree of reproduceability of this method."

Respectfully submitted,
J A Woodruff, *Secretary*

Back numbers of American Dyestuff Reporter less than two years old may be obtained from Howes Publishing Co, Inc, 44 East 23rd St, New York 10, N Y at the following prices: 50¢ each, $7.50 for a complete volume in USA; 75¢ each and $15.00 per volume overseas. Earlier numbers may be obtained from the Secretary, American Association of Textile Chemists and Colorists, P O Box 28, Lowell, Mass. Prices postpaid: 50¢ each to nonmembers of AATCC, 35¢ to members; complete volumes $5.25 to nonmembers, $4.50 to members.

AATCC Calendar

COUNCIL
Week of Sept 10th (New York, N Y); Nov 16; Jan 18, 1957

NATIONAL CONVENTIONS
Sept 13-15, 1956 (Waldorf-Astoria, New York) (as part of the Perkin Centennial, Sept 10-15); 1957 (Boston); 1958 (Hotel Conrad Hilton, Chicago); 1959 (Washington, D C)

HUDSON-MOHAWK SECTION
June 22 (Annual Outing)

NEW YORK SECTION
June 22 (Outing—North Jersey Country Club, Wayne Township, N J)

NORTHERN NEW ENGLAND SECTION
Sept 28 (Annual Outing—Wachusett Country Club, West Boylston, Mass); Oct 19 (Science Park, Boston, Mass); Dec 1 (Annual Meeting—Hotel Vendome, Boston)

PHILADELPHIA SECTION
Sept 28 (Abraham Lincoln Hotel, Reading, Pa); Nov 2 (Drake Hotel, Philadelphia, Pa); Dec 7 (Kugler's Restaurant, Philadelphia, Pa)

PIEDMONT SECTION
Oct 6 (Annual Meeting—Hotel Charlotte, N C)

RHODE ISLAND SECTION
Oct 18 (Johnson's Hummocks Grille); Dec 6 (Annual Meeting, Johnson's Hummocks Grille)

SOUTH CENTRAL SECTION
June 22-23 (Lookout Mountain Hotel, Chattanooga, Tenn); Dec 1 Hotel Patten, Chattanooga, Tenn)

SOUTHEASTERN SECTION
Sept 22 (Columbus, Ga); Dec 8 (Atlanta, Ga)

WESTERN NEW ENGLAND SECTION
Oct 15 (Annual Meeting—Hartford, Conn); Nov 16 (Rapp's Restaurant, Shelton, Conn)

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

Activities of the Local Sections

JOINT MEETING——
NORTHERN NEW ENGLAND SECTION & LOWELL TECHNOLOGICAL INSTITUTE STUDENT CHAPTER

April 27, 1956

Lowell Technological Institute, Lowell, Mass

HEAD TABLE (l to r): John H Jacoby; Raymond W Jacoby, AATCC president; George O Linberg, chairman, AATCC National Convention Committee; Martin J Lydon, president, Lowell Technological Institute; Marcella S Czekanski, chairman, LTI Student Chapter; John M Gould, chairman, Northern New England Section; Edward B Bell, vice chairman, NNE Section; Jayant K Sanghrajka, student speaker; Robert C Schiek, student program cochairman; Therese A Polak, student speaker; Carmen F Genzabella, student speaker.

**Front Row (l to r): R W Jacoby; J M Gould; M S Czekanski; M J Lydon;
Back row (l to r): E B Bell; Ernest R Kaswell, AATCC vice president, New England Region; G O Linberg; Azel W Mack, secretary, NNE Section.**

**Front row (l to r): Robert J Peirent, faculty advisor, LTI Student Chapter; T A Polak; J M Gould; M S Czekanski; Elmer E Fickett, professor emeritus, LTI; Alan A Denio, student speaker.
Back row (l to r): Charles D Flamand, student speaker; R C Schiek; Harry N Tobler, student program cochairman; Robert F Keenan, student speaker; C F Genzabella; John Scaringi, treasurer, LTI Student Chapter; J K Sanghrajka.**

Dinner at the LTI cafeteria.

Perkin Centennial Notes

CONSIDERABLE progress is being made in plans for the exhibits that will be a feature of the Perkin Centennial celebration. Henry L Young, chairman of the Exhibits Committee, reports enthusiastic response from members of the dye-producing industry to joint participation in the exhibit titled "A More Colorful World."

The exhibit will be historical and educational in nature and will depict the story of dyes, where they originated and what they mean to our national and industrial economy. The proposed plan features a number of integrated parts and illustrates the historical background of man's attempt to color materials with natural dyes. The scarcity and high cost of available dyes obtained from nature is pointed up and leads to the discovery of mauve by taking the visitor through the gateway to a more colorful world, showing a framed setting of William H Perkin at work in his laboratory.

Another room is to be devoted to a textile fibers and fabrics exhibit and will carry the keynote theme of "A More Colorful World" through the display of "A Galaxy of Fibers and Materials." In addition to exhibits of natural fibers, the remarkable advances made in the domain of synthetic fibers, many of which are actually coal-tar derivatives, will provide an educational counterpart to the dyes exhibit and clearly depict the close relationship between dyes and textiles. A third display will center upon the functional finishes that help to make colored textiles practical and beautiful by imparting desirable properties and characteristics that are sought by the ultimate consumer. Many leading American manufacturers of fibers and textile finishes have signified their intention of taking part in this notable event.

A fourth unit will be contributed by the AATCC and is to exhibit colorfastness and other testing equipment developed to assist in the production of finer quality fabrics to meet exacting standards.

Spot Test———

(*concluded from page 398*)

color reaction upon addition of Solution II took place within the drop of liquid on the surface of the fabric instead of on the fabric itself, again allowing positive identification.

In the second case, the fabric was treated with Permel Resin in combination with monomeric methylol urea. Again the identification stains did not wet the fabrics. The color reaction was typical of monomeric methylol urea but was slow in reaction rate like melamine resins. Again the color reaction took place in the drop of solution on the fabric instead of on the fabric itself and permitted positive identification.

MISCELLANEOUS———In order to insure proper interpretation of the identification test, it is necessary to run familiarization trials with cloths treated with known resins. It is also advisable to retain samples of cloths treated with known resins as a means of confirming identification of an unknown resin. The identification stains on cloths cannot be retained as standards because of degradation of the spotted areas due to the action of concentrated sulfuric acid. It may be possible to prepare color reference standards by means of dyestuffs, but this approach has not been investigated.

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Abstracts

The Irgalan Dyes—Neutral-dyeing Metal-complex Dyes

Schetty, G, *J Soc Dyers Colourists* **71**, 705-24, December, 1955.

The chemistry of chromium-complex dyes is discussed in relation to their dyeing properties on wool, with particular reference to the problem of avoiding skittery dyeing arising from differences between individual wool fibers. The structural features required for dyes to give non-skittery dyeings under neutral conditions are deduced, and the author shows how these researches, which are described in great detail, resulted in the production of a new series of neutral-dyeing metal-containing dyes (the Irgalans).

The first member of this series was put on the market by Geigy in 1941. Other chemically similar products appeared shortly thereafter, including the Capracyl dyes (Du Pont), Cibalan dyes (Ciba), Lanasyn dyes (Sandoz), Supralan dyes (General) and Neutralan dyes (Pharma Chemical).

All these dye ranges consist of chromium- or cobalt-containing azo dyes, containing no ionizing lyophilic groups, in which two dye molecules are combined with one metal atom.

The present paper gives a comprehensive picture of these novel groups of dyes, and attempts not only to describe their dyeing behavior but also to explain this in relation to their chemical background.

Skitteriness is a specific property of a dye, and is of considerable importance. Skittery-dyed wool can be described as that in which individual fibers show big differences in depth of dyeing. Wool textiles may of necessity consist of very different fiber qualities. In wool fibers of different origin, and even within a single wool fiber, there are morphological and chemical differences that affect the rate of exhaustion of certain dyes. A dye that does not produce skittery dyeings will cover up these differences, but a skittery dye will show marked variation in the rate of exhaustion on the individual fibers.

Perhaps the most important propetry of the Irgalan dyes, according to the author, is their nonselective dyeing of different wool qualities, and hence their ability to yield level dyeings without skitteriness.

Their dyeing properties are compared with those of the metal-complex dyes requiring strongly acid dyebaths, as well as with the metal-free milling dyes. The author remarks that the dyeing of wool with Irgalans is similar to that of acetate with disperse dyes, in that it is governed by the difference between the solubility of the dye in the dyebath and on the wool fiber.

A long bibliography, including numerous patent references, concludes the paper.—WHC

The Control of Ion Concentrations in Wool Processing Solutions

Technical Correspondent, *Textile Recorder* **73**, #873, 65-7 (1955); #874, 59-61 (1956).

The amphoteric and consequently highly reactive nature of the wool fiber substance is the main reason for close control of all processing in chemical solutions. Wool at all stages is exposed to oxidation and/or the action of alkaline liquors; both having a deteriorating influence on the fiber.

The author shows how control of the pH value is of great importance in many wet processes to which wool is subjected. For example, in wool scouring, the optimum pH value of the scouring liquor is 10.7, and this figure should not be exceeded if the fiber is to remain undamaged.

He discusses the scouring action of both soap and synthetic detergents. He points out that in scouring with the synthetics there is a considerable amount of adsorption of detergent by the wool, varying with the pH of the solution (increasing with falling pH), and states that the adsorbed detergent may affect the subsequent processes.

Careful control of the pH of dye solutions is necessary. The author explains the chemistry of the dyeing process when acid dyes are used, and states that the attraction of wool for dye is determined mainly by the pH of the dyebath. The dyeing rate and the total amount of the dye taken up by the wool may be affected by previous treatments, such as carbonizing and chlorination, which alter the pH of the dyebath. To keep the pH in equilibrium, the author lists various acids and acid salts that may be added to the bath.

The dyeing behavior of the Palatine Fast dyes is influenced by the pH of the bath. The maximum dyeing capacity is generally between pH 3.5 and 5.5. The monosulfonic acids are said to require a higher pH value than the disulfonic acids for maximum yield.

The metachrome dyeing method is explained. The writer states that as compared with other chrome dyeing processes, the metachrome method has the least harmful effect on wool because the pH of 5.5 which is employed corresponds approximately to the isoelectric point of wool.

Eleven references to the literature are cited.—WHC

News of the Trade

Avisco, Burkart-Schier Sign Contract

American Viscose Corp and Burkart-Schier Chemical Co have signed a contract by which the latter firm will manufacture certain Avisco textile chemicals to specification and act as sole selling agent in 17 states.

American Viscose will sell chemicals directly in the states not covered by the arranagement with Burkart-Schier. The Tennessee firm will function as selling agent in Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, North and South Carolina, Ohio, Tennessee, Texas, Virginia, and West Virginia.

Testing and evaluation of chemicals for sizing, finishing, and conditioning will continue to be done by the Corporation's Textile Research Department as well as by Burkart-Schier Laboratory in Chattanooga.

23rd SRPDA Outing

230 members and guests attended the 23rd outing of the Silk & Rayon Printers and Dyers Association of America last month at the North Jersey Country Club, Wayne Twsp, NJ.

Golf honors went to M Mangarelli, Franklin Finishing Co, with a low gross of 73, while the team of Charles Maupai and Charles Rummel of F P Maupai Dyeing Co won the horseshoe pitching event.

SRPDA president Dean Lewis of Colonial Piece Dye Works presided at the evening banquet and distribution of prizes along with Joseph F Wildebush, executive vice president. Fred Kern of Maupai Dyeing served as outing chairman.

Polyvinyl Chemicals, Inc Now Incorporated

Polyvinyl Chemicals, Inc, Peabody, Mass, has announced its incorporation. The new company was formerly a division of the Stahl Finish Co. Officers elected by the board of directors are Max Potash, president; Harold Naidus, vice president in charge of development; Samuel S Stahl, vice president; and Louis E Stahl, secretary-treasurer. This company manufactures acrylic copolymer emulsions and specialty vinyl-acetate copolymers for use in the leather, textile, paper and adhesive industries.

In connection with a recent item which appeared covering the reactivation of Francolor Inc, a subsidiary of Compagnie Francaise des Matieres Colorantes, it has been brought to our attention that the initial duty of Jack H Firpo, general manager, was the opening of offices at 162 Main Street, Woonsocket, R I.

The above address will be the headquarters for Francolor Inc, and from this office all operations in connection with sales and services to the United States market will be directed.

A further step in the reorganization program will be the setting up of a sales division for the New England area which will be directed from Woonsocket.

The sole distributors of Compagnie Francaise des Matieres Colorantes in Canada is Clough Dyestuff Co, Ltd, 1375 Cote Vertu, St Laurent, PQ, who handle the business direct with Francolor's headquarters in Paris, France.

Luther

Lumar Corp Formed

A new chemical company to be known as the Lumar Corp, with general offices and plant at 217 Mill St, Cleveland, Tenn, has been formed. Officers of the new firm are: William F Luther, president; T J Marler, vice president and treasurer; and Jac Chambliss, secretary.

Lumar Corporation will manufacture and offer a number of specialized chemical products for use by the textile, paper and other industries. Particularly for the textile industry, Lumar will specialize in dry processing chemicals, such as fugitive identification tints, antistatic agents, spinning assistants, wax finishes and winding emulsions.

In the field of textile dry processing chemicals, Dr Luther has had particularly broad experience, serving for the past 10 years as director of research for Dixie Mercerizing Co and its subsidiary companies. In addition, he has served as head of the Textile Department of the Industrial Research Institute of the University of Chattanooga.

Mr Marler has headed the Marler Chemical Co of Cleveland, Tenn, manufacturers of chemicals for the textile wet-processing industry.

Universal System for Expressing Yarn Count Voted

Twenty nations represented at last month's textile meetings of the International Organization for Standardization at Southport, England, voted on a universal system for expressing yarn count.

The word "Tex," which indicates the yarn weight in grams per 1,000 meters, should be used exclusively by their technologists, the countries agreed. The ISO group stated that this system would displace the multiplicity of yarn numbering systems now used in each country.

This action is reported to have been supported by representatives of International Wool Textile Organization, International Linen and Hemp Confederation and BISFA (International Bureau for Standardizing Synthetic Fibers).

The seventeen United States delegates attending the meetings were nominated by various organizations to represent the American Standards Association, US member of the 37-country organization, at the meetings of ISO Technical Committee 38 on Textiles, held May 11-18.

The committee is divided into the following working groups: colorfastness testing, shrinkage of fabrics in washing, systematic reduction of the number of cloth widths, yarn testing, fiber testing and ropes and cordage.

William D Appel, chief, Textiles Section, Organic & Fibrous Materials Division, National Bureau of Standards, served as leader of the United States delegation.

Other members of the delegation were: T L W Bailey, Jr, US Department of Agriculture; Earl E Berkley, Anderson, Clayton & Company; George S Buck, Jr, National Cotton Council of America; Louis A Fiori, US Department of Agriculture; Otto Goedecke, Otto Goedecke Corp; Joel F Hembree, University of Texas; Kenneth L Hertel, University of Tennessee's Agricultural Experiment Station; Charles E Hilton, American Standards Association; William A Newell, North Carolina State College; Edward T Pickard; Arthur G Scroggie, E I du Pont de Nemours and Company, Inc; A L Vandergriff, Lummus Cotton Gin Co; Benjamin L Whittier, North Carolina State College; William L Wilt, The Sheffield Corp; John W Wright, US Department of Agriculture; and Carl L Whitney, Department of the Army, Quartermaster Research and Development Command.

Samincorp Chemical Trading to be Handled by New Division

The chemical trading of Samincorp South American Minerals & Merchandise Corp, 445 Park Ave, New York, NY, is now being handled by a new division—Shepard Division of Samincorp—for the import, export, sale and distribution of industrial and fine chemicals and raw materials.

B John Shepard of Shepard Chemical International, Inc, has been appointed manager of this division.

Samincorp's chemical business on behalf of the South American units of the Hochschild organization will continue to be handled by Samincorp's Chemical Department, which is managed by Steven R Mayer.

Reckitt's Seagull Ultramarines to be Distributed by Whittaker

Appointment of Whittaker, Clark & Daniels, Inc, New York, NY, as sole distributor of Reckitt's Seagull Ultramarines in the United States was announced recently.

Reckitt's entry into the United States market of industrial type blues, under the trademark Seagull, is a new venture, although their ultramarines have been used in laundry products in this country for many years.

The Seagull brand blues are available in a wide range of ultramarine shades extending from the brilliant blues through the delicate violets. The color characteristics of Seagull Ultramarines are said to match those of the native lapus lazuli with amazing fidelity, and to possess a purity of shade and permanence or fastness to light which offers several important advantages in industrial application.

It is claimed that no other pigment yields the same blue color, either in the mass tone color, or on reduction with white.

Ga Tech Announces New Scholarships

Coats & Clark, Inc has made available to the Georgia Institute of Technology two scholarships in the amount of $500 a year for a four-year period each, to be used for students in the textile, chemical or mechanical engineering fields. Two similar four-year scholarships will be established each year hereafter.

One of the conditions of the scholarship grants is that, in the event there are available applicants who are sons or daughters of employees of Coats & Clark, Inc, they will be given preference over other applicants for these scholarships.

Edward Gutekunst, of Hellwig Dyeing Corp (left) and T Bayard Baldridge, Jr, of the Fletcher Works, study the new 33-inch, 100-pound Super Self Balancing Extractor on show for demonstration in The Fletcher Works' new retail-type showrooms in Philadelphia. Photo was taken during open house at the plant marking the opening of the new showroom.

Ninol Announces New Moves in Chicago

Ninol Laboratories, Inc, Chicago manufacturers of synthetic detergents and emulsifiers, have announced the transfer of their research and development laboratories to their new plant on the south side of the city. At the same time, the business and executive offices are being moved to larger quarters at Prudential Plaza in the Loop.

Warehouse stocks are now maintained at Los Angeles, San Francisco, Chicago, Dallas and Philadelphia.

Enlarged Aniline Plant on Stream

The second unit of National Aniline Division's aniline plant at Moundsville, W Va, is now operating at capacity.

This new plant, brought on stream in April, doubles the aniline production capacity of the Moundsville Plant, using a modern catalytic process developed in the research laboratories of the Division at Buffalo, NY, and reportedly producing an exceptionally pure and uniform aniline exceeding ACS specifications for CP aniline, a quality material produced only by National Aniline at Moundsville.

Supplies of the new, high-quality aniline are assured, since all requisite raw materials—mixed acid, benzene and hydrogen—are available within the Allied Chemical & Dye Corporation family of producing divisions.

Nopco Honors Veteran Employees

Thirty-nine employees of Nopco Chemical Co who have completed 15 years of service and 13 who have been with the Company 25 years received awards at a recent party given in their honor. The presentation was made by Ralph Wechsler, president of Nopco, who made a brief welcoming speech.

The 15-year veterans, who automatically become members of the Nopco 15-year club, was the largest group ever to be inducted into the organization at any one time, and brings the membership in that group up to 26.3% of the total Nopco personnel. Of these, 67 have been with the company from 25 to 40 years.

Countless commuters and visitors to Grand Central Terminal, New York have watched urethane foam being made with National Nacconates, products of National Aniline Division, Allied Chemical & Dye Corporation. The lecture and demonstration were staged 23 times daily during the month of May as part of an exhibit by Allied Chemical & Dye Corporation in cooperation with the investment firm of Merrill, Lynch, Pierce, Fenner & Beane.

METRO-ATLANTIC GIVES AWAY $5000 LIFE INSURANCE POLICY—On the final day of the recent BAMA show, a $5000 life insurance policy was given away at a free drawing sponsored by Metro-Atlantic, Inc, Centredale, RI, to celebrate the announcement of their newly "insured" Ranedare water-repellent series. The products are now actually insured by a major insurance company.

2000 buyers attending the show participated in the drawing, which took place in the showrooms of Spatz Brothers, makers of boys' outerwear and raincoats treated with Ranedare. Taking part in the selection of the winning name were: (l to r) Hugh J Bonino, vice president, Metro-Atlantic, Inc; Sheila Haynes; Lee Spatz, Spatz Brothers; and Stuart L Sperber, director of sales promotion, Metro-Atlantic, Inc. The winner of the policy, T H Hoskin, represents T Earon Co, Ltd of Montreal.

Several guests and Goodyear Chemical Division personnel on hand for the seminar on synthetic latex polymers are shown here. From left to right: F W Frew, sales manager, Decatur Chemical Co; A E Polson and W C Smith of Goodyear; F W Cox, Jr, Deering-Milliken Research Trust; and H R Thies, general manager of the Goodyear Chemical Division.

AOCS Events

Next event on the calendar of the American Oil Chemists' Society is the 1956 short course on Unit Processes in the Fatty Oil, Soap, and Detergent Industries, to be held at Purdue University July 16-20 with R J Sims, Swift and Company, as program chairman and F W Quackenbush, Purdue University, as local chairman. The course is being held under the direction of the Education Committee, of which K F Mattil of Swift and Company is chairman.

Following this will be the August 1 deadline for manuscript entries in the Fatty Acid Producers' Award competition, which the Society is administering for the Fatty Acid Division of the Association of American Soap and Glycerine Producers Inc. The award is $500.

On September 24-26 the 30th fall meeting of the Society will be held in Chicago at the Sherman Hotel, with A F Kapecki, Wurster and Sanger Inc, and C W Hoerr, Armour and Company, as co-chairmen.

Registration fee for the short course will be $50, payable in advance to the American Oil Chemists' Society at 35 E Wacker Drive, Chicago, Ill. Room and board will be available on a hotel basis at the Memorial Union or at a commercial hotel.

Delta Kappa Phi Confers Honorary Memberships

The 32nd National Convention of the Delta Kappa Phi Fraternity of America, Inc, was held recently at Atlanta, Ga, with the student chapter at Georgia Institute of Technology serving as host. Representatives from the textile colleges in the eastern states were present, as were those from various alumni chapters.

The two-day convention was highlighted by the election to honorary membership of **Walter M Mitchell**, vice-president of Draper Corp, and the initiation as an honorary member of **Thomas H Quigley**, director of industrial education for the State of Georgia.

Maurice R Fox, Arnold Hoffman & Co, Inc, also was nominated and elected to receive an honorary membership into the Fraternity. He was formerly initiated on May 16th at a special meeting of the New Bedford Textile alumni and student chapters. Mr Fox, currently "on loan" from Imperial Chemical Industries, Ltd of London to Arnold, Hoffman will return to England this month where he will resume his duties on the technical staff of ICI.

Delta Kappa Phi plans to hold its 33rd Convention in Philadelphia in April, 1957.

Approx 150 Attend Goodyear Seminar

More than 150 persons, representing Southern industries, attended the recent technical seminar on synthetic latex polymers conducted by the Goodyear Tire and Rubber Company's Chemical Division in Atlanta, Ga.

The event was held in the Hightower Textile Building at the Georgia Institute of Technology. Main topics covered in the day-long meeting included development, production, evaluation, properties and uses of synthetic latices.

Keynote speaker, Herman R Thies, general manager of the Goodyear Chemical Division, opened the session by presenting a broad review of the relatively new synthetic latex industry.

J D D'Ianni, assistant to the vice president in charge of research and development at Goodyear, discussed the "Theoretical Consideration of Polymerization and Latex Characteristics."

Other Goodyear speakers included A E Polson, W C Smith, and E W Scott. Topics ranged from a consideration of basic latex properties to typical end-use applications. Question and answer sessions highlighted the morning and afternoon meetings.

Colorful products utilizing latex were exhibited in a display unit built to resemble a typical chemical reactor.

Nonwoven fabric, sized denim, latex-backed carpet and upholstery, latex-sized fabrics and pigment-printed materials illustrated typical textile applications.

WATCH FOR THE PERKIN CENTENNIAL ISSUE • AUGUST 27, 1956

Colorspun Carpet Staple

Colorspun rayon staple for carpets will soon be produced by American Viscose Corporation, in addition to the Avisco carpet rayon now available. Colorspun is the Avisco trademark for solution-dyed fibers.

American Viscose has been producing Colorspun filament yarns and staple for apparel and home furnishings for several years and is currently expanding its color range in these fibers.

George L Storm, vice president, has pointed out that the color range of Avisco carpet rayon staple will be limited to a few basic shades.

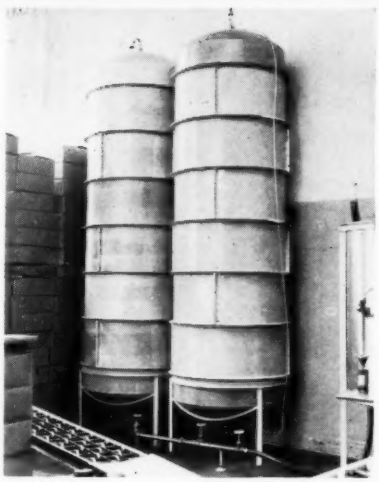
Suitable exhibits in a central gallery will demonstrate the properties of modern, synthetic dyes and their uses in the home, fashion and industry. These will explain how the dye industry has made it possible to satisfy the desire for color through the availability of thousands of dyes, unlimited in supply, at a cost within the reach of all. Colorful globe settings in the form of metal and plastic worlds illustrate the wide variety of materials that are enhanced in beauty and appeal through color. Included will be textile fibers, paper, leather, plastics, film, petroleum products, paints, etc. Other exhibits will graphically illustrate the dfferent industries and their many products that have grown out of the dye industry—such as pharmaceuticals, agricultural chemicals, synthetic rubber, plastics, exposives, elastomers, petroleum products, antioxidants, textile-finishing agents, etc.

Enley Perma-Demon

Low cost, mineral-free water, equivalent in ionic purity and softness to distilled water, is now available from any water outlet with the Perma-Demon Unit according to the unit's manufacturer, Enley Products, Inc, 1236 Broadway, Brooklyn 21, N Y.

Reportedly capable of producing up to 100 gallons of mineral-free water before ion-exchange material is exhausted, the Perma-Demon is claimed to have the lowest initial and operating cost of any water demineralizer of its size. Does not require cartridge replacement by the manufacturer. Easily maintained, the Perma-Demon is said to permit exhausted ion-exchange material to be replaced by the user with fresh material obtainable everywhere.

This unit is constructed of clear, break - resistant, high - temperature plastic. Supplied complete ready for use. Priced at $19.95.



Pair of 520 gallon Polybilt Tanks as installed for storage and dispensing of chemical bleaches.

Polybilt Tanks

Approximately ten years ago laminates of polyester resins, reinforced with glass fiber, were first introduced. They had such characteristics as excellent corrosion resistance to a wide variety of chemicals, specific strength greater than steel, light weight and tolerance to a wide range of temperatures. Not being thermoplastic, they do not soften at elevated temperatures.

Because of these characteristics, they have found a wide variety of uses. In the textile and paper industries they have been used for tanks, piping, ductwork and other uses where combination of properties made them invaluable.

Perhaps the greatest drawback to their extensive use has been the difficulty and expense of fabricating large units. Small fiberglass plastic items have been produced in large quantities at low cost by press molding, eg, tote boxes, trays, small chemical containers, etc. The large, few-of-a-kind items have been produced on special molds by hand lay-up, a time-consuming, expensive process. In spite of this, thousands of units have been fabricated because no other material has such a combination of properties.

Now a new approach to the fabrication of reinforced plastic tanks for corrosive conditions is typified by Polybilt® tanks, distributed by Jones & Hunt, Inc, 20 Emerson Avenue, Gloucester, Mass.

Realizing the practical impossibility of press-molding a great many tank sizes, it was decided to press-mold standard size tank sections which could then be assembled on the job to provide a great range of capacities and at a cost comparable to almost any metal tank.

A 250-ton press is used with polished matched metal dies. The parts are molded on these steam heated cut-off dies so as to give a uniform wall thickness of 0.100 inch. Basically, the parts are taken from the mold ready to ship.

Polybilt tanks are constructed from two standard sections: a domed end section (16″ deep x 36″ dia), and a center section (16″ deep x 36″ dia). In the assembling of a tank, a flanged center section is attached to a flanged end section by 48 bolts with a neoprene gasket between the sections. As many center sections as required may be added to give the required capacity.

Preformed pipe fittings are molded of the same material with either a spherical radius or a cylindrical radius so they may be installed in any desired position on the tank. Although usually installed at the factory to suit user requirements, it is said that these fittings can be installed by unskilled labor in the field.

Among the advantages claimed for Polybilt tanks are: low cost (Jones & Hunt, Inc mention a price of about $135 for a 200-gal tank), immediate delivery from stock of any combination of sections, light weight, corrosion resistance to most chemicals and low shipping cost.

It is reported that the use of these tanks by the chemical, textile and other industries has been so encouraging that the manufacturer is now in process of having metal dies made for a large tank to be constructed on the same principle.

AFC Introduces Synthetic Fiber Felts

Perfection by American Felt Company of an improved technique of mechanically interlocking synthetic fibers of all types to produce felt-like structures was announced earlier this month by Wm Howard Lehmberg, president of the company.

The perfection of this manufacturing development reportedly makes possible the production of industrial fabrics possessing all of the desirable three-dimensional physical characteristics of wool felt plus the desirable chemical and thermal properties possessed by man-made fibers.

Hunter Develops New High-Speed Jet Dryer

The James Hunter Machine Company, North Adams, Mass, has introduced The Uniflow, a new type jet single-pass tenter dryer for spun synthetics, blends, woolen and worsted fabrics. According to James H Hunter, vice president, it delivers a substantially higher rate of production per linear foot of floor space than has heretofore been possible.

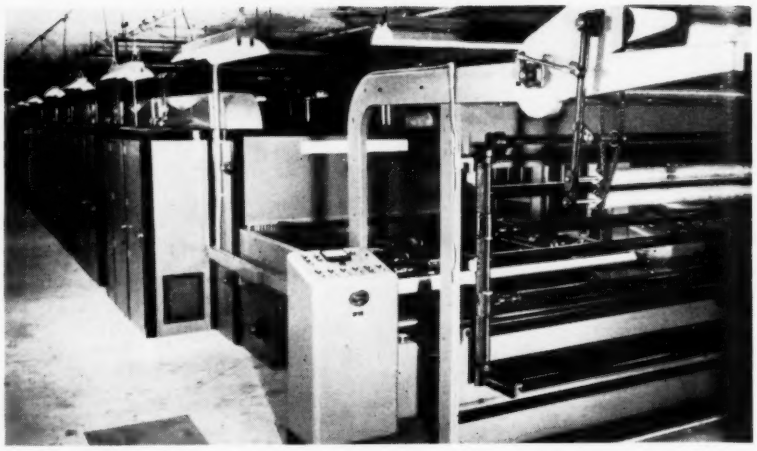
For the past several months, Hunter engineers have been experimenting in the laboratory and, as a result of these experiments, have developed an air system which, when incorporated into the final machine, is claimed to accomplish the following goals:

1) Highest possible production per linear foot of floor space.
2) Complete uniformity of airflow.
3) Accessibility
4) Ease of maintenance and cleaning
5) Complete automatic control
6) Elimination of danger of dirt or grease spots

The Hunter Uniflow utilizes high-velocity air impinging on the cloth from the greatest possible proximity. Regular production is reported to have demonstrated that the cloth is dried with absolute uniformity across the face, and most important in piece dyed goods, the drying from the face to the back of the cloth is said to be absolutely even. No additional control attachment is necessary to maintain the same uniformity of dryness in the selvedges. They dry at the same rate as the center and rest of the fabric. According to Mr Hunter, "there can be no detectable variation of dryness in any section or part of the yardage processed."

The machine is seven feet high. The overfeed, Askania guide, folder drive, machine drive and width-regulating mechanism are engineered into the dryer itself. All chain and timing belt drives are protected and enclosed in a small, although readily accessible, space. The motors are at floor level, A built-in spray-oiling system has been installed at the feed end of the Uniflow, which runs continuously when the dryer is in operation and keeps the chain lubricated. All bearings on the entire machine are outside the heat and easily reached.

"The entire assembly of the fan and heater chamber is such that a man can walk in from both sides simply by opening a door, and can work on or clean any part of the machine without taking off panels," states Mr Hunter. "It has been our experience that dryer efficiency will remain high as long as it can be kept clean. Previous dryers have been difficult to clean, particularly in the heater sections."



COMPACT DESIGN of the Hunter Uniflow single-pass dryer is evident from these photographs taken at J P Stevens & Co. Overfeed, Askania guide, folder drive, machine drive and width-regulating mechanism are engineered into the opening end of the dryer.

When the door to each fan chamber is opened in the Uniflow, the heaters are exposed to view. The heaters themselves are not obstructed by casings. Any flock which may have filtered through the screens can be blown out and the heaters are so mounted that they can be removed quickly. The screens which are placed in front of the heaters for filtering are mounted on the inspection door. When it is necessary to clean the screens, the operator opens the door and the screen swings out into the room where it can be brushed off. This eliminates the necessity of handling heavy, hot screens.

All controls are mounted in two cubicle-type panels at the front of the dryer.

A new automatic drive called the Adjusto-Speed is used. It consists of a regular induction motor which drives a magnetic clutch. This clutch has two slip rings which receive a small amount of direct current from a rectifier (provided with the machine). As the direct current is increased on this clutch, it grabs more than when the current is less, and thus runs the dryer at any speed at which the control is set.

Another control feature is dynamic braking. It is claimed that, even at top speed, the dryer will stop within 18" after the push button is depressed. The same control feature allows automatic acceleration. Once it is stopped and started up again, it will automatically come back to its preset speed. "Dynamic braking is very important at high speeds, especially if the cloth should not be pinned properly, due to a scallop or seam," states Mr Hunter. "It means that the operator is able to catch the fault before it gets into the dryer."

A pneumatic overfeed has been designed with pressure applied on each nip roll, which can be separately adjusted from side to side. (Automatic cloth guidance is provided by an Askania double jet-type unit regulator.)

The airflow engineering in the machine reportedly eliminates all possibility of oil spots on the cloth. After impingment, all of the air travels outward towards the tenter chain. If there is any dirt on the chain, it is swept onto the screen, rather than recirculated onto the cloth.

It is claimed that the tracks in the Hunter Uniflow are so constructed that the wear strip taking the side pull of the chain can be quickly and easily removed and replaced. All tracks in this new dryer are machined together.

Hunter officials believe that it is important to point out that the Uniflow overcomes a problem formerly believed to be inherent in all single-pass pin-type machines using high-velocity air, namely, that of the cloth tending to be blown off the pins. Hunter attacks this problem with a swinging-type pin plate, which enables the cloth to be pinned with the pin angle in an approximately straight position. However, as the cloth is carried through the Uniflow, the pins swivel to a 40° angle from the vertical.

• NAMES IN THE NEWS •

Reese

Tull

Bender

Neesby

McArthur

Arnold Hoffman & Co, Inc, has announced the appointment of **Leonard G Tubbs** as general sales manager. Mr Tubbs was formerly sales manager for the company's Northern branch, and he will continue his present duties temporarily.

Mr Tubbs, who has been with Arnold, Hoffman for the past 18 years, replaces **Reid Tull** as general sales manager. The latter recently announced his acceptance of a position with Proctor Chemical Company, Inc, as vice-president in charge of sales development.

Macbeth Corporation and subsidiaries, Newburgh, NY, manufacturers of industrial color control illumination and electronic instruments, has announced the appointment of **Warren B Reese** as vice-president of the Macbeth Corporation. Mr Reese was formerly general sales manager of the Macbeth Corporation and will continue to direct sales of the expanding line of Macbeth products from his new position.

Walter W Larkin has joined United Aniline Co, Norwood, Mass, as a research chemist.

Mr Larkin was for many years associated with the American Woolen Co, with responsibility for the development of formulas for the dyeing of wool and Orlon and worsted and Dacron combinations.

William F Dolan, who is undergoing a course of training with Nopco Chemical Co, preparatory to becoming a sales representative for the Textile Chemicals Division of the Company, has been awarded one of the 1955-56 Phi Psi Awards.

The Awards are presented annually to outstanding seniors majoring in textile technology at textile colleges having chapters of Phi Psi Fraternity.

Max Bender has been elected chairman of the NJ Chapter of the American Institute of Chemists. Dr Bender is a senior research chemist with the Bound Brook, NJ Laboratories of American Cyanamid Company's Research Division.

Outgoing Chairman is **Cecil L Brown,** manager, scientific liaison, Esso Research and Engineering Company, who becomes a representative to the National Council of the Institute.

Dr Bender has been active in the Institute for five years and held the position of chairman-elect prior to his election as chairman. All posts are of one year's duration.

Ronald Fisher Mawrey, special technical representative of Reckitt & Colman (Overseas) Ltd, is currently in New York consulting with, and advising Whittaker, Clark & Daniels, Inc, sales representatives on the chemical and physical properties of Reckitt's Ultramarine Blues. This technical program is expected to embrace direct calls on Whittaker customers, with individual members of the Whittaker sales organization.

As announced elsewhere in this issue, Whittaker was recently appointed sole distributor in the United States for Reckitt's Ultramarine Blues.

With completion date of the Food Machinery and Chemical Corporation (Chemical Divisions) central research laboratory only a short time away, a business manager for the new facilities has just been appointed. **S Philip Marcus** will be business manager at the Princeton center, where long-range research programs will be carried out for the benefit of all six operating divisions.

Mr Marcus was formerly administrative assistant to **Carl Prutton,** vice president and technical director of FMC.

E F Drew & Co, Inc, has announced the appointment of **Torben E Neesby** as technical director of its Textile Chemicals Department.

He was formerly head of organic and inorganic research for Carroll, Dunham Smith Pharmacal Company.

Sun Chemical Corporation has announced the appointment of **A L McArthur, III,** to its Warwick Chemical Company division as technical sales representative for the North Carolina area, headquartering in Greensboro.

Mr McArthur will be responsible for the sales of all Warwick textile chemicals. Prior to joining Warwick, he was employed by Burlington Industries as chief chemist of the Cramerton Division, later being assigned to their Finishing Division research program.

G H Law has been appointed vice-president—research, and **H M West** has been appointed manager—textile fibers of Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation.

Dr Law joined the Union Carbide organization in 1929 in the Research and Development Department of Carbide and Carbon Chemicals Company, South Charleston, W Va, and since that time has been employed in the research work of the Company. In 1951 he moved to New York to fill the position of director of research, which post he held at the time of his present appointment.

Mr West started with Carbide and Carbon in 1941. He became assistant to a vice-president of the company in 1955.

Jared J Mowry recently joined the organization of Polymer Southern, Inc, Greenville, SC, as vice-president.

His duties as vice-president will be to assist in management and in the coordination of sales in both the Southern and Eastern territories.

A realignment of sales management responsibilities has been announced by the Industrial Chemicals Division of Olin Mathieson Chemical Corporation.

Kenneth C Frazier has been appointed manager, general products sales department, with responsibility for general product sales planning and programming, exclusive of field sales.

Field sales activities will be handled as a separate responsibility, under the direction of **Derek Richardson** as manager and **O J Theobald, Jr,** assistant manager.

Both organic and inorganic products will be handled through these groups.

A separate sales development department has been established with **Laurence E Russell** as manager. This department will have responsibility for technical service, market development, and market research.

All divisional activities pertaining to accounting, treasury, budgets and financial analysis have been centralized in an administrative services department, with **Cecil L Williamson** as manager.

Two new sales representatives have been added to the latex and lotol department of the Naugatuck Chemical division, United States Rubber Co.

James T Fairclough, Jr, formerly a chemist at Naugatuck Chemical's Gastonia, NC, plant, has been assigned to the Georgia area with temporary headquarters at Gastonia.

Robert Dudley, previously a chemist in the company's latex research and development group, will make his headquarters in Philadelphia, Pa.

Price

Hanson

Knox Price has been appointed western regional sales manager of Heyden Chemical Corporation. Mr Price also will continue as west coast sales manager of Nuodex Products Company, a division of Heyden, a position he has held since 1951.

Earl Hanson has been appointed western regional representative to assist Mr Price on both Heyden and Nuodex activities. Mr Hanson has been a technical service representative for the C K Williams Company since 1950.

Clarence J Stewart has been elected assistant secretary and assistant treasurer of American Aniline Products, Inc by that company's board of directors. American Aniline is a Koppers Co, Inc, subsidiary.

Mr Stewart, whose headquarters will be in New York, replaces **Kelvin L Shields,** who has been named manager of finance, Administration Section, Koppers Finance Department.

Before his election, Mr Stewart was assistant treasurer and assistant secretary of the Durathene Corporation, another Koppers subsidiary.

Mr Shields joined Koppers in 1935. In 1947 he was transferred to the Control Section.

General Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
Gordon Research Conference—Textiles Program, July 9-13, Colby Junior College, New London, N H.

AMERICAN ASSOCIATION FOR TEXTILE TECHNOLOGY, INC
Sept 5, Oct 3, Nov 7, Dec 5 (All meetings at the Vanderbilt Hotel, New York, N Y).

AMERICAN SOCIETY FOR TESTING MATERIALS
Sept 16-22—2nd Pacific Area National Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles, Calif; Oct 16-19—Fall Meeting of Committee D-13 on Textiles, Warwick Hotel, New York, N Y.

THE FIBER SOCIETY
Fall Meeting—Sept 6-7, Warwick Hotel, New York, N Y, Spring Meeting — May 1-2, 1957, The Clemson House, Clemson, S C

THE INSTRUMENT SOCIETY OF AMERICA
11th Annual Instrumentation-Automation Conference and Exhibit—Sept 17-21, New York Coliseum, New York, N Y

LOWELL TECHNOLOGICAL INSTITUTE
Sept 26-28 (Perkin Centennial observance and open house).

PERKIN CENTENNIAL
September 10-15. Waldorf-Astoria Hotel, New York, N Y.

THE QUARTERMASTER ASSOCIATION
Annual Convention—Oct 27-28, Conrad Hilton, Hotel, Chicago, Ill.

SOUTHERN TEXTILE EXPOSITION
19th Exposition, Oct 1-5, Textile Hall, Greenville, S C.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Sept 11, Oct 9, Nov 7 (Palm Terrace Suite, Hotel Roosevelt, New York, N Y).

Szak

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